2017

United States Department of Agriculture

National Agricultural Statistics Service

Agricultural Statistics Board

Washington, D.C. 20250

August 2017

Agricultural Resource Management Survey (ARMS)

Phase II – Field Crop Chemical Usage and Production Practices

Interviewer's Manual

This page intentionally left blank.

Table of Contents

Chapter 1 - ARMS Purpose 101
Uses of ARMS Data 102
Pesticide Data Program 103
Natural Resource Data and Farm Practices 104
Cost of Production 105
Income, Financial, and Household Data 106
Publication of ARMS 106
ERS Topic Pages: 109
Chapter 2 - Terms and Definitions 201
Chapter 3 - Survey Procedures 301
Questionnaire 301
Respondent Booklet 302
Respondent Burden 302
Questionnaire Format 303
Interviewer Instructions 303
Include Statements and Check Lists 303
Text Fill-ins 303
Instructions for Respondents 304
Optional Wording 304
Item Code Boxes with Decimal Points 304
Item Code Boxes for Recording Dates 305
Office Use Boxes 306
Yes/No Questions 306
YES/NO Check Boxes 306
YES=1 Boxes 306
Multiple Choice Questions with Coded Response Categories 307
Questions with More than One Sub-part 307
Entering Data 307
Planning Your Work 308
Interviewing 309

Framework and Reference Period for Reporting Data 311
Non-response 311
Supervision 312
Completed Questionnaires 312
Chapter 4 - Screening 401
Face Page 401
Introduction 401
Target Name, Address, and Partners Verification 401
Screening Survey Information Form 402
Beginning Time 402
Screening Box on Face Page 403
Back Page 403
Chapter 5 - Completing the Questionnaire 5001
Overview 5001
Section A - Target Commodity Field Selection 5003
Section A Purpose 5003
Screening Survey Information 5003
Item 1: Total Acreage of Target Commodity 5003
Item 2: Total Number of Fields 5005
Item 3: Identification of Fields 5005
Item 4: Random Number Selection 5006
Field Selection Grid Supplement 5007
Mapping Fields on the Field Selection Grid Supplement 5007
Using Farm/Ranch Maps 5007
Numbering the Fields 5008
Item 5: Informing Respondent of Field Selection 5010
Item 6: Farm, Tract, and Field 5010
Item 7: Randomly Selected field is Target Commodity 5011
Section B - Field Characteristics 5012
Section B Purpose 5012
Item 1: Field Acres 5012
Item 2: Tenure Arrangement 5013
Item 3: Cash Rent Paid 5014

Item 4: Landlord's Share of the Crop 5014
Item 5: Cost of Inputs Provided by Landlord 5015
Item 6: Cost of Inputs Provided by Contractor 5015
Item 7: Year Began Operating Field 5016
Item 8: Planting Date 5016
Item 9: Seed Source 5017
Item 10: Seed Cost 5018
Item 11: Seeding Rate 5018
Item 12: Acres Replanted 5018
Item 13: Resistant Seed Type 5019
Item 14: Seed Treatment Code 5019
Item 15: Field Harvested 5019
Item 16: Acres Harvested and Yield 5019
Item 17: Straw 5021
Item 18: Straw Acres 5021
Item 19: Type of Livestock Grazed Selected Field 5022
Item 20: Crops Planted in Previous Years 5023
Item 21: Resource Concerns 5027
Item 22: Land-Use Practices 5027
Item 23: Conservation Program Participation 5031
Cost Sharing Payments for Conservation Program Participation 5032
Item 24: Conservation Funding 5032
Item 25: Reasons for not applying for Conservation Program 5033
Item 26: Conservation Funding 5034
Item 27: NRCS Classification of Highly Erodible Land 5035
Item 28: Wetland Designation 5035
Item 29: Field Slope 5035
Item 30: Soil Type 5035
Item 31: Subsurface Drainage 5036
Item 32: Hail Crop Insurance 5036
Item 33: Federal Crop Insurance 5037
Section C – Nutrient or Fertilizer Applications 5039
Section C Purpose 5039

Use of Supplements 5039
Item 1: Screening for Nutrient or Fertilizer Applications 5040
Item 2: Number of Commercial Nutrient or Fertilizer Applications 5040
Item 3: Nutrient or Fertilizer Applications Table 5041
Item 4: Nutrient or Fertilizer Custom Costs 5050
Item 5: Total Nutrient or Fertilizer Material Costs 5050
Item 6: Gypsum 5051
Item 7: Soil Test for Organic Matter 5051
Item 8: Soil or Plant Tissue Test 5051
Item 9: Phosphorus Soil Test 5051
Item 10: Nitrogen Soil Test 5052
Item 11: Plant Tissue Test 5052
Item 12: Cost of Soil/Plant Tests 5053
Item 13: Reason for Nitrogen Application Rate 5053
Item 14: Lime Applications 5055
Item 15: Unprocessed Manure or Other Organic Material Applications 5056
Item 16: Manure Application Rate Restrictions 5059
Item 17: Non-Commercial Compost Application 5060
Section D - Biocontrols or Pesticide Applications 5063
Section D Purpose 5063
Use of Supplements 5064
Use of Records 5064
Use of the Respondent Booklet 5064
Item 1: Biocontrols or Pesticide Applications 5066
Item 2: Information for Unlisted Biocontrols or Pesticides 5082
Item 3: Biocontrol or Pesticide Custom Costs 5084
Item 4: Biocontrol or Pesticide Material Costs 5085
Section E - Pest Management Practices 5086
Section E Purpose 5086
Introduction and Definition of Pests 5086
Item 1: Weather Data to Assist Determining Pesticide Applications 5087
Item 2: Biological Pesticides Applied 5087
Item 3: Pesticides Rotated or Tank Mixed to Prevent Pest Resistance 5088

Item 4: Were Herbicides Used and Were Herbicides Applied Before Weeds Emerged? 5088
Item 5: Were Herbicides Applied After Weeds Emerged? 5088
Item 6: Records Kept to Track Pests 5088
Item 7: Scouting Data Used to Compare to Infestation Threshold Guidelines 5089
Item 8: Method of Pest Scouting 5090
Item 9: Established Scouting Process Used 5090
Item 10: Reason for Scouting Selected Field 5090
Item 11: Pest Scouting 5091
Item 12: Scouting Costs 5092
Item 13: Used Field Mapping of Previous Weed Problems 5092
Other Pest Management Practices 5093
Item 14: Use of Other Types of Pest Management 5093
Item 15: Beneficial Organisms 5096
Item 16: Biological Pest Control 5096
Item 17: Trap Crop 5097
Item 18: Fallow Insect Control 5097
Item 19: Water Management Practices 5097
Item 20: Protection of Beneficial Organisms 5097
Item 21: Yield Loss due to Pests 5098
Section F - Field Operations, Labor, and Custom Services 5099
Section F Purpose 5099
Field Operations Table 5099
Item 1: Field Operations 5100
Completing the Field Operations Table 5103
How to Record Tandem Field Operations 5111
Item 2: Labor Used on the Field 5115
Items 3 & 4: Wage Rate for Paid Workers 5115
Item 5 & 5a: Contract Labor Costs 5116
Item 6: Percent of Unpaid Work Done by Those Under 16 5116
Item 7: Custom Services 5117
Item 8: Wheat Dried before Storing or Sale 5117
Item 9: Technical or Consultant Services 5118
Item 10: Cost of Technical or Consultant Services 5118

Item 11: Data Collection Tools 5118
Data Collection Tools Used 5118
Item 12: Farm Data 5119
Item 13: Crop Management Recommendation 5119
Item 14: Yield Monitor 5119
Item 15: GPS Equipment 5120
Section G - Irrigation 5121
Section G Purpose 5121
Item 1: Acres of Target Commodity Crop Irrigated in this Field 5121
Item 2: Irrigation Operations 5122
Item 3: Cost of Fuel or Electricity Used to Irrigate 5129
Item 4: Purchased Water 5130
Item 5: Replacement Cost for Siphon Tubes 5131
Item 6: Cost for Poly Pipe 5131
Item 7: Gated Pipe System Used 5131
Item 8: Water from Wells 5132
Item 9: Additional Pipe Used 5133
Exhibit 5.1: Types of PRESSURE Irrigation Systems 5134
Exhibit 5.2: Types of GRAVITY-FLOW Irrigation Systems 5138
Section H - Conclusion 5142
Item 2: Location of Selected Field 5142
Item 3: Marking Field Locations on the Map 5142
Item 4: Re-contact in the Spring 2018 5143
Item 5: Survey Results or Other Agency Publications 5143
Item 6: Ending Time 5144
Items 7a, 7b, 7c: Records Use 5144
Item 8: Supplements Used 5145
Administrative Items 5145

This page intentionally left blank.

Chapter 1 - ARMS Purpose

Data collected in the Agricultural Resource Management Survey (ARMS) is the primary source of information to the U.S. Department of Agriculture (USDA) on a broad range of issues relating to agricultural resource use, costs, and farm sector financial conditions. The ARMS is the only source of information available for objective evaluation of many critical issues related to agriculture and the rural economy.

Specific commodities are rotated every 5-6 years to focus on resource use and production costs for those commodities. Other commodities appear from time to time to address policy relevant resource use or financial issues. National irrigation use, animal waste management, risk management strategies, genetically-modified crops, and organic production and marketing are current topics of interest.

The ARMS is normally conducted in three phases. The initial screening phase, conducted from May through July, collects general farm data such as crops grown and the gross value of sales. Screening survey data are used to identify in-business operations, multiple operating arrangements, and operations having the targeted commodities. With screening data, we can choose respondents for subsequent phases based on whether they have commodities of interest.

The second phase (Phase II) is conducted from October through December. This phase focuses on chemical use and other production practices for target commodities. The target commodities for the 2017 ARMS Phase II Production Practices and Costs Report (PPCR) is Wheat. The target commodities for the 2017 ARMS Phase II Production Practices Report (PPR) are cotton and soybeans. Due to coordination with fall surveys data collection can begin as early as September.

Phase III, conducted from January through April, collects data to examine farm sector financial conditions, including income, assets, and debt.

All Phase II respondents completing Production Practices and Costs Report (PPCR) will be asked to complete a Phase III follow-on report to obtain financial data for the entire operation. It is vital that both the Phase II and Phase III questionnaires be completed for these operations. Data from both phases provide the link between agricultural resource use and farm financial conditions. This is the cornerstone of the ARMS design.

Uses of ARMS Data

Generally, farmers benefit from ARMS data indirectly. They see the information through contact with extension advisors, in reports issued by State colleges and universities, in farm magazines, newspapers, and on radio or TV spots. Most respondents probably do not realize that the data comes from this survey.

Farm organizations, commodity groups, agribusiness, Congress, and the USDA use information from ARMS to evaluate the financial performance of farm/ranch businesses and to make policy decisions affecting agriculture. Producer associations and the USDA's Farm Service Agency (FSA) use for ARMS data is on the costs of production, particularly when developing proposals for commodity programs.

Specifically, the ARMS:

- gathers information about the relationships among agricultural production, resources, and the environment. ARMS data provides the necessary background information to support evaluations of these relationships. The data are used to understand the relevant factors in producing high quality food and fiber products while maintaining the long term viability of the natural resource base.

- determines what it costs to produce various crop and livestock commodities, and the relative importance of various production expense items.

- helps determine net farm income and provides data on the financial situation of farm and ranch businesses, including the amount of debt. ARMS data provides the only national perspective on the annual changes in the financial conditions of production agriculture.

- provides the farm sector portion of the Gross Domestic Product (GDP) for the Nation. If ARMS data were not available, the Bureau of Economic Analysis (BEA) would have to conduct their own survey of farm operators to collect this data.

- helps determine the characteristics and financial situation of agricultural producers and their households, including information on management strategies and off-farm income.

Pesticide Data Program

The National Agricultural Statistics Service (NASS) has collected agricultural fertilizer and pesticide use data for major field crops and selected fruit, vegetables, melons and strawberries for several years. This data has been used in building a database for the USDA Pesticide Data Program (PDP). The PDP is used by USDA to evaluate the safety of the Nation's food supply.

In 2002, the Food Quality Protection Act (FQPA) was signed to reform the nation's food safety laws. FQPA was first implemented in 1996, to increase the need for actual, reliable chemical use data. FQPA requires the Environment Protection Agency (EPA) to conduct an accelerated review of tolerance levels for re-registration of pesticide products.

Part of the EPA review includes using actual chemical usage data. **Only the grower can provide these data**. If these data are not available, EPA could assume maximum label rates are being applied on all crop acreage. This would likely over count the true amount of pesticides being used to produce field crops. The result could be cancellation of the product registrations for chemicals farmers rely on.

Other USDA agencies are closely involved in the PDP and the FQPA with NASS. The other agencies are the Agricultural Marketing Service (AMS), Economic Research Service (ERS), and Agricultural Research Service (ARS). These agencies collect and analyze agricultural chemical use and residue data to estimate potential human exposure to pesticide residues in the U.S. food supply. The results of their analysis will be used to help make decisions concerning product registration issues, risk assessments, benefit assessments, and for marketing commodities at the State, National and international level.

Field crop growers have a vested interest in the risk analysis because many pesticides they rely on are classified as "minor use". Growers often have no alternatives to these chemicals. If re-registration is not allowed on products used on specialty crops, such an action could have serious consequences for both farmers and consumers.

The important benefits gained from responding to the survey are:

- Growers have a chance to tell how they use chemicals responsibly to maintain a safe and abundant food supply.

- The survey results are official USDA estimates and help to establish the facts about chemical use. Accurate data can be used to lessen concern relating to marketing and exports to other countries.

- Accurate and timely information on actual usage can be used in the decision making process for product registration, re-registration and product alternatives.

Natural Resource Data and Farm Practices

The 2008 Farm Bill (official title: The Food, Conservation, and Energy Act of 2008) emphasized conservation on "working land" (i.e., conservation programs that protect and enhance natural resources while keeping farmland in production) by increasing funding for the Environmental Quality Incentives Program (EQIP) and establishing a new Conservation Stewardship Program (CSP). These two working-land conservation programs provide financial and technical assistance to improve conservation effort on lands in production. These programs are estimated to receive 17 percent increase in funding. This increased funding reduces Conservation Reserve Program acreage cap to 32 million acres beginning October, 2009.

The EQIP was established by the 1996 Farm Act as a new program to consolidate and better target the functions of the Agricultural Conservation Program (ACP), Water Quality Incentives Program (WQIP), Great Plains Conservation Program (GPCP), and Colorado River Basin Salinity Program. The objective of EQIP, like its predecessor programs, is to encourage farmers and ranchers to adopt practices that reduce environmental and resource problems through 1- to 10-year contracts providing education, technical assistance, and financial assistance targeted to watersheds, regions, or areas of special environmental sensitivity identified as priority areas. The 2008 Farm Act added forest management as activity eligible for grant funds.

The CSP replaced the Conservation Security Program but is similar to the past program. This program provides payments to producers for adopting or maintaining a wide range of conservation management and land-based structural practices that address 1 or more resources of concern such as soil, water, or wildlife habitat. As with EQIP, a wide range of practices can be subsidized. But CSP will focus on land-based practices and specifically excludes livestock waste handling facilities. Please note: Because contracts are 5-10 years in length, there will be some farmers who still have Conservation Security Program contracts.

To guide policy makers in the decision-making process, it is necessary to have reliable information about production practices used and the relationship of the practices to changes in the quality of our soil and water resources. Decisions affecting agricultural policy and producers will be made with or without data. It is much better to have factual information to guide the decision process. Farm production covers a major share of the natural resources of the country and, its' policy about how to manage production is formed; a better understanding of the production process can prevent uninformed choices.

The agricultural community is currently faced with many complex issues concerning the environment, such as fertilizer and pesticide use, soil erosion, and pesticide residue and restriction. ARMS data is useful in addressing some of these concerns. For instance, fertilizer and pesticide data are used to study water quality. Data on production practices such as machinery use and crop rotation help to identify tillage systems and crop residue levels affecting soil erosion. Pesticide data help measure the economic impact on agricultural production from restricting use or cancellation of a pesticide product or to determine the human and environmental risk of continued use. Data measuring the extent and intensity of pesticide use will aid in the development of residue monitoring programs to improve food safety.

Cost of Production

A Congressional mandate exists for the development of annual estimates of the cost of producing wheat, feed grains, cotton, and dairy commodities. USDA also collects cost of production data for soybeans, rice, peanuts, hogs, and beef cow-calf in order to provide economic information for comparison among the major farm commodities that compete for U.S. agricultural resources. Wheat is the cost of production commodities targeted for the 2017 ARMS Phase II.

To assure accurate and reliable estimates, a comprehensive survey is needed to obtain data on production practices and on the amounts of inputs used. Crop and livestock costs and returns estimates provide a basis for understanding changes in the relative efficiency of crop and livestock production and the breakeven prices needed to cover all costs.

ARMS provide data needed to develop commodity accounts showing costs and input use by size and type of farm in different regions of the country. Commodity accounts show the costs of resources provided by farm operators and any landlords and contractors involved with producing a specific commodity.

Detailed information is needed for several farm inputs to estimate commodity costs. Most farm operations produce more than one commodity, such as corn and soybeans. This diversity causes special problems in determining commodity costs. For example, seed corn can easily be allocated to commodity costs for corn because it is only used to grow corn. However, machinery such as tractors and implements can be used for many activities on the farm, and costs for a commodity like corn cannot easily be separated from whole farm costs. Therefore, it is necessary to collect detailed data on each field operation in order to estimate machinery costs for the commodity being surveyed.

USDA is required to update commodity costs annually. However, ARMS focuses on a specific commodity only once every five or six years. With ARMS data for physical inputs (such as seed, fertilizer, and chemicals used), analysts update cost estimates using input price data from other annual surveys. For example, seed, fertilizer, and chemical price indexes generated from the NASS Prices Paid Survey are used with these input costs from ARMS to update annual estimates of each expense item. To estimate fuel costs, annual fuel price indexes are applied to the survey year fuel costs, while fuel use estimates from the survey year are kept constant. Minor adjustments of input usage rates can be incorporated each year based on changes in acreage and yields.

Income, Financial, and Household Data

In addition to Phase II resource management and cost of production data, Phase III of the ARMS obtains detailed information about farm finances, debt, assets, and household characteristics. ARMS is the only national data source for determining the effect of price, debt, and other financial variable changes on different types and sizes of operations on an on-going basis. Responses to questions about farm assets and debts are used to develop a balance sheet for the farm as well as to provide a variety of financial ratios for use in measuring financial performance.

Publication of ARMS

Most Regional Field Offices (RFO) use information from several NASS and ERS reports in preparing publications for their State.

- NASS reports are available on the Internet at: http://www.nass.usda.gov/
- ARMS web data tool at https://www.ers.usda.gov/data-products/arms-farm-financial-and-crop-production-practices/

- ERS reports are available on the Internet at: http://www.ers.usda.gov/.
- Farm Income and Balance Sheets at https://www.ers.usda.gov/data-products/farm-income-and-wealth-statistics/
- Cost of Production at: http://www.ers.usda.gov/data-products/commodity-costs-and-returns.aspx

The NASS publication, Agricultural Chemical Usage - Field Crops, provides estimates of acreage treated with fertilizer and chemicals and total amounts applied, using data from the ARMS Phase II. The results of the 2017 Phase II will be released in May, 2018.

NASS publishes Farm Production Expenditures using data from Phase III. This report shows expenditures for 17 expense categories in the U.S., 5 farm production regions, 7 U.S. economic size groups, and U.S. crop and livestock farms. The 2017 survey results will be released in August, 2018.

ERS also prepares or updates several state, regional, and national reports using data from the phase 2 ARMS. These reports show operating and financial characteristics by type of farm, and by income and debt/asset categories. Some of the ERS publications resulting from ARMS include:

Agricultural Resources and Environmental Indicators: Research report was last released in 2012. This ERS basebook contains a wealth of information covering a broad range of subjects in resource and environmental economics. Topics include land use, quality, and ownership; farm real estate values; water use and quality; fertilizer, pesticides, energy, and farm machinery; technology; and the conservation reserve, compliance, wetlands, and non-USDA programs that affect agriculture. (see on the Internet at: https://www.ers.usda.gov/publications/pub-details/?pubid=44691

The First Decade of Genetically Engineered Crops in the United States: Ten years after the first generation of genetically engineered (GE) varieties became commercially available, adoption of these varieties by U.S. farmers is widespread for major crops. Driven by farmers' expectations of higher yields, savings in management time, and lower pesticide costs, the adoption of corn, soybean, and cotton GE varieties has increased rapidly. Despite the benefits, however, environmental and consumer concerns may have limited acceptance of GE crops, particularly in Europe. This report focuses on GE crops and their adoption in the United States over the past 10 years. It examines the three major stakeholders of agricultural biotechnology and finds that (1) the pace of R&D activity by producers of GE seed (the seed firms and technology providers) has been rapid, (2) farmers have adopted some GE varieties widely and at a rapid rate and

benefited from such adoption, and (3) the level of consumer concerns about foods that contain GE ingredients varies by country, with European consumers being most concerned. https://www.ers.usda.gov/publications/pub-details/?pubid=43741

No-till Farming is a Growing Practice: Most U.S. farmers prepare their soil for seeding and weed and pest control through tillage—plowing operations that disturb the soil. Tillage practices affect soil carbon, water pollution, and farmers' energy and pesticide use. Therefore, data on tillage can be valuable for understanding the practice's role in reaching climate and other environmental goals. In order to help policymakers and other interested parties better understand U.S. tillage practices and, especially, those practices' potential contribution to climate-change efforts, ERS researchers compiled data from the ARMS and the National Resources Inventory-Conservation Effects Assessment Project's Cropland Survey. The data show that approximately 35.5 percent of U.S. cropland planted to eight major crops, or 88 million acres, had no tillage operations in 2009. https://www.ers.usda.gov/publications/pub-details/?pubid=44515

On the Doorstep of the Information Age: Recent Adoption of Precision Agriculture: The adoption of precision agriculture, which encompasses a suite of farm-level information technologies, can improve the efficiency of input use and reduce environmental harm from the over-application of inputs such as fertilizers and pesticides. Still, the adoption of precision agricultural technologies and practices has been less rapid than envisioned a decade ago. Using ARMS data collected over the past 10 years, this report examines trends in the adoption of four key information technologies—yield monitors, variable-rate application technologies, guidance systems, and GPS maps—in the production of major field crops. While yield monitoring is now used on over 40 percent of U.S. grain crop acres, very few producers have adopted GPS maps or variable-rate input application technologies. https://www.ers.usda.gov/publications/pub-details/?pubid=44576

The Economics of Glyphosate Resistance Management in Corn and Soybean Production: Widespread use of glyphosate (a highly effective herbicide) for corn and soybean has led to glyphosate resistance, and recent surveys suggest that acreage with glyphosate-resistant weeds is expanding. This report explores a number of issues related to the decline of glyphosate's effectiveness and choices for managing resistance to it. https://www.ers.usda.gov/publications/pub-details/?pubid=45357

The Profit Potential of Certified Organic Field Crop Production: This study uses data from targeted surveys of organic corn, wheat, and soybean production in an observational analysis of cost-of-production differences between conventional

and organic crop production systems. Findings of this research suggest that significant economic returns are possible from organic crop production, mainly due to organic price premiums. https://www.ers.usda.gov/publications/pub-details/?pubid=45383

ERS Topic Pages:

Nutrient Management: http://www.ers.usda.gov/topics/farm-practices-management/crop-livestock-practices/nutrient-management.aspx

Pest Management: http://www.ers.usda.gov/topics/farm-practices-management/crop-livestock-practices/pest-management.aspx

Soil Tillage and Crop Rotation: http://www.ers.usda.gov/topics/farm-practices-management/crop-livestock-practices/soil-tillage-and-crop-rotation.aspx#.UcsiB9jNktk

Livestock Practices: http://www.ers.usda.gov/topics/farm-practices-management/crop-livestock-practices/livestock-production-practices.aspx

Manure Management: http://www.ers.usda.gov/topics/farm-practices-management/crop-livestock-practices/manure-management.aspx

Annual Report to Congress on the Status of Family Farms

Financial Performance of U.S. Farm Businesses

Farm Operating and Financial Characteristics

Characteristics of Farms with Sales of $50,000 or more

The Economic Well-Being of Farm Operator Households

National Financial Summary

Productivity & Efficiency Statistics

ARMS data are also used to develop USDA's **Agricultural Income and Finance Situation and Outlook** report.

This page intentionally left blank.

Chapter 2 - Terms and Definitions

Enumerators working on the ARMS should be familiar with the definitions of the terms listed below. Descriptions of irrigation systems have been described in Chapter 5 of this manual.

Abandoned Acres – Acres that were not (will not be) harvested for any purpose.

Abnormal Farms – See institutional farms.

Actual Nutrients – The reporting primary plant nutrients expressed in terms of active ingredients or units of nitrogen, phosphorus, potassium, and sulfur applied. A unit equals 1 pound.

Active Ingredients – The ingredients in fertilizer or pesticides which chemically react with soil, plant, animal, or pest to give the desired effect.

Adjuvant – Chemical added to a pesticide to increase its effectiveness or safety.

Beneficial Insects – Any of a number of species of insects that perform valued services like pollination and pest control. Also, any insect that improves the soil, pollinates plants, or controls harmful pests.

Biocontrol – A method of controlling pests that relies on predation, parasitism, herbivory, or other natural mechanisms.

Biological Pesticide – A naturally occurring substance that controls pests.

Carryover – [Pesticides] Chemical pesticide residuals remaining in the soil a year or more after being applied. Residual levels are influenced by chemical type, amount or rainfall, and soil type. The carryover from some chemicals may affect the growth of certain crops planted in later years.

Commodity – Any agricultural or agricultural by-product available for sale.

Confidentiality – The assurance for NASS to survey respondents, backed by federal law, is that individual information collected on authorized USDA surveys will not be released to any person, organization or institution, including court subpoenas. See the "NASDA Employee Handbook" for regulations.

Conservation Tillage – Any of several tillage and planting methods that leave a minimum of 30 percent of the soil surface covered by crop residue following planting. The method should provide for seed germination, plant growth, and weed control yet maintain effective ground cover throughout the year and disturb the soil as little as possible. It reduces soil loss and energy use while maintaining crop yields and quality. Weeds are controlled primarily with herbicides.

Contour Farming – Field operations such as plowing, planting, cultivating, and harvesting at right angles to the ground's natural slope to reduce soil erosion, protect soil fertility, and use water more efficiently. Furrows, crop rows, and wheel tracks across the slope act as miniature terraces.

Cost of Production – The average amount in dollars per unit used in growing or raising a farm product, including all purchased inputs and sometimes including allowances for management and the use of owned land. The cost may be expressed in units of a bushel, pound, ton or per-acre, depending on the product involved.

Cropland – Land which can produce a crop for harvest (pasture and timber are not considered crops). Cropland includes land cropped, idle land suitable for cropping, land in orchards, etc. Do not include woodland, marshes, or land suitable only for pasture.

Crop Insurance – Any Federal, state, or private insurance (multipurpose or specific).

Crop Rotation – The growing of different crops in a repeating sequence on the same land.

CWT (Hundredweight) – A common unit of measure in agriculture. This marketing term referring to 100 pounds of a commodity (i.e. milk, small grain, meat). Abbreviated "CWT."

Date, Due – [Enumerators] The date assigned materials must be received in the Regional Field Office. [Regional Field Office] The date assigned materials must be received in Headquarters.

Date, Reference – The date used as a reference point for asking respondents survey questions. For example, the reference date for the Agricultural Surveys is the first day of the month, for ARMS it's a specific year.

Date, Release – The date the survey results are published and released. See the NASDA EMPLOYEE HANDBOOK for a calendar of the various report release

dates.

Defoliant – A chemical agent that causes the leaves to drop from a plant. Often used with some crops to facilitate harvest.

Double Crop – The growing of two crops for harvest in one year from the same field.

Editing – Reviewing entries for reasonableness and validity on completed questionnaires. Unusual but correct responses should be flagged and explained with notes indicating it was verified with the respondent. With impossible data relationships, probe for the correct response.

Fallow – Cropland left uncropped during one growing season to conserve moisture in the soil, control weeds and allow the decomposition of crop residue.

Farm – Land under one operating arrangement on which there were or could be sales of a least $1,000 worth of crops, livestock, poultry, or other agricultural products during the year.

Fertilizer – Any material put on or in the soil or on plant leaves to improve the quality or quantity of plant growth. See "Micronutrients," "Nitrogen," "Phosphate," "Potash," "Sulfur," and "Trace Element."

Fertilizer Analysis – The percentage of nitrogen, phosphate, potash, and sulfur (N, P2O5, K2O, S), specified in that order, contained in a blend of fertilizer. Fertilizer may also be blended with various micronutrients or trace elements.

Field – A continuous area of land devoted to one crop or land use. Farmstead, pastureland, woods, wasteland, etc. are considered fields.

Filter Strip – An area of permanent herbaceous vegetation used to reduce sediment, organics, nutrients, pesticides, and other contaminant loadings in runoff.

Fungicide – A chemical used to kill fungi.

Gallons per Minute – Measure of water flow-rate. The quantity of water flow (or pumped) during one continuous minute measured in gallon units.

Grassed Waterways – A natural drainage way within a field which is kept in grass to prevent soil erosion. Includes channels used as outlets for terraces and for the disposal of runoff from diversion channels, stabilization structures, contoured rows,

and natural depressions.

Green Chop – An alternative to pasture. The crop is cut in the field and brought to the animal. Suitable crops are corn, grass, whole crop grain, and legumes.

Harvested Acres – Acres of a crop actually harvested. It may be smaller than planted acres if there is abandonment brought on by weather, pest damage, other disasters, or market prices too low to cover harvesting costs.

Hay – A crop which has been cut and cured by drying for storage; principally legumes, grasses, or grain crops.

Highly Erodible Land (HEL) – Soil erosion can be caused by rainfall or wind. Rainfall erodibility is a function of rainfall intensity, soil properties, slope, and slope length. Wind erosion is a function of prevail winds, soil texture, and topography. NRCS uses these characteristics and a measure of soil loss tolerance to construct an erodibility index. If the index is greater than 8, the field is highly erodible.

Herbicide – Any chemical used to control, suppress, or kill plants, or to severely interrupt their normal growth processes. Some kill essentially all plants, but others are selective.

Hundredweight (CWT) – A common unit of measure in agriculture. This marketing term referring to 100 pounds of a commodity (i.e. milk, small grain, meat). Abbreviated "CWT."

Idle Land – Farm land that is tillable and capable of producing a crop without major clearing of trees and stones or drainage of water but is not being cropped, pastured, or fallowed.

Implement – Any farm machine used to perform various field operations when raising crops.

Improvements – Houses or other buildings, fences, clearing of rocks, wells or other related capital assets that increase land's productivity or value.

Inaccessible – A sample unit which cannot be contacted, interviewed, etc., during the survey period.

Input – Items such as seed, fertilizer, chemicals, feed, machinery, fuel, labor, and/or land used in the production of an agricultural product.

Input Provider – The company or individual that sells or contributes products used in the production of agricultural commodities.

Insecticide – A chemical used to kill insects.

Institutional Farms – Farm operations such as Indian Reservations, prison farms, private or university research farms, not-for-profit farms operated by religious organizations, and high school FFA farms. These types of farms do not have the same expenses or income patterns as traditional farms.

Integrated Pest Management (IPM) – The control of one or more pests by a broad spectrum of techniques ranging from biological means to pesticides. The goal is to keep damage below certain economic levels without eliminating the pest completely.

Irrigation Set – The area of the field irrigated by an irrigation system as it moves across a field while not ceasing operation.

Landlord – The owner of land or buildings which are rented to another person for cash, a portion of the crop or livestock, other proceeds, or for free.

Landplaster – A pure, natural gypsum ideal for a wide range of agricultural uses and has proven to be an excellent source of calcium and sulfur to benefit peanut production.

Lime – Ground limestone (calcium carbonate) that helps correct an acidic soil condition.

Military Time – A system of time as a unit of a 24 hour day rather than as a time within AM or PM. See the NASDA Employee Handbook, Appendix A. Clock Hour Conservation, for a Military time table.

N-P-K and S – Chemical symbols for nitrogen, phosphorus, potassium, and sulfur. Chief ingredients of fertilizer.

National Institute of Food and Agriculture (NIFA) – A USDA agency providing farmers and rural people leadership, evaluation, and coordination in support of state and county educational programs. It also provides access to agricultural research and information on federal regulations and policy, food safety, agricultural marketing, disaster awareness, sustainable agriculture, waste management, water quality, and youth at risk. The former Extension Service is now a part of this Agency. This Agency was formerly known as Cooperative State Research, Education,

& Extension Service (CSREES).

Natural Resources Conservation Service (NRCS) – A USDA agency charged with national soil and water conservation program in cooperation with landowners, operators, developers, community planning agencies, and other local, state, and federal agencies. Soil Conservation Service is now part of NRCS.

Nitrogen (N) – A chemical element essential to life and one of the primary plant nutrients. Animals get nitrogen from protein feeds, plants get it from soil, and some bacteria get it directly from air. Nitrogen is one of the three primary ingredients in complete fertilizers. Nitrogen content in a fertilizer's analysis is indicated as the XX's in XX-0-0.

Non-response – Failure of a respondent to reply to a survey questionnaire; may be item non-response (refuse to answer one or more questions), survey non-response (refuse to answer any or most of the questions), or inability of enumerator to locate respondent during the survey period.

No-till – Method of planting crops without seedbed preparation. Seeds are planted directly into the previous crops stubble. Soil disturbance is limited to small slits in the soil needed for seeding. There is usually no cultivation during crop production with chemicals used for weed control.

Nutrient – A substance that provides nourishment for growth.

Operator – The person responsible for all or most of the day-to-day decisions such as planting, harvesting, feeding, or marketing for the tract or total land operated. The operator could be the owner, hired manager, cash tenant, share tenant or a partner. If land is rented or worked on shares, the tenant or renter is the operator.

Organic – A production system that is managed in accordance with regulations governing organics to respond to site-specific conditions by integrating cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biodiversity. Note that no genetically modified seed or synthetic pesticides can be used in an organic production system.

Out-of-business – A previous farm or ranch operator who no longer makes the day-to-day decisions on land suitable for agriculture; raises no crops, livestock, or poultry; has no on-farm grain storage facilities. They may own farmland which is being operated by someone else. See "Retired", and "Sold-out."

Partner – An individual that shares the day-to-day decision making with someone else.

Pesticide – A substance or mixture of substance to control insects, rodents, fungi, weeds, and other forms of plant or animal life considered to be pests. Pesticides include insecticides, fungicides, herbicides, and nematocides.

Phosphate (P_2O_5) – A term indicating a fertilizer which supplies phosphorus, one of the three primary ingredients in a complete fertilizer. The phosphate content in a fertilizer's analysis is indicated as the XX's in 0-XX-0.

Plant Tissue Test – Plant tissue analysis provides information on how the plant is using particular nutrients and gives clues for deciphering nutrient deficiency or excess problems.

Potash (K_2O) – A term used to indicate fertilizers which supply high levels of potassium. The potash content in a fertilizer's analysis is indicated as the XX's in 0-0-XX.

Questionnaire – A form or computer program (CATI, CAPI) used to ask specific questions from and to record the response given by selected sample units to the survey questions.

Refusal – A person representing a sample unit who will not cooperate in the survey and who refuses to provide sufficient information to satisfactorily complete the questionnaire, or who will not give an enumerator permission to complete field counts or measurements.

Rent – Reimbursement to the owner (landlord) from the user (tenant) for land, buildings, equipment, livestock, etc., used in production.

Rent, Cash - Fixed – predetermined dollar amount paid for the use of land, buildings, equipment, livestock, etc.

Rent, Share – Method of paying rent, where the owner receives a share of the crop, livestock (or product, such as milk or wool) as payment for use of land, buildings, equipment, livestock, etc. and usually shares in some of the costs.

Respondent – The person who provides the information necessary to complete a survey interview.

Retired – A previous farm or ranch operator who in now out-of-business because

he/she has reached an age to retire from farming or ranching. He/she may still own farmland, which is being operated by someone else. See "Out-of-Business."

Sample, List – A sample of potential farm operators or agribusinesses selected from a List Sampling Frame (LSF).

Sample, Probability – A sample where every sampling unit of the sampling frame (area or list) has a known, nonzero chance of being selected.

Sampling Frame – A population or list of all possible units which meet a specified criteria to draw a sample.

Sampling Unit – An identifiable unit of a sampling frame that may be selected when drawing a sample. For an area frame sample it may be a segment, tract or field and for a list frame sample it is a name.

Scouting – A process of checking a field for the presence of weeds, insects, or disease and gathering information about pest population levels, activity, size, and/or density.

Seed – An embryonic plant with sufficient nutrients required during germination and early growth until the plant is able to produce its own food.

Sold-out – A previous farm or ranch operator or operation that is now out-of-business due to selling the entire farming or ranching operation; no longer owning any farmland; crop, livestock, or poultry facilities or grain storage facilities. See "Out-of-Business."

Strip Cropping – Growing crops in a systematic arrangement of strips or bands to serve as barriers to wind and water erosion.

Sub-irrigation – Water supplied through underground tile or perforated pipe in sufficient amounts to maintain a water table close to the soil surface to supply water for crop needs.

Sulfur (S) – Sulfur is a macronutrient which can be found in commercially produced fertilizers.

Surface Water Sources – Water stored in natural ponds or lakes, flowing in streams and rivers, and water stored in man-made reservoirs.

Surfactant – A chemical added to a pesticide which improves the emulsifying,

dispersing, spending, and/or wetting properties of the pesticide.

Survey – The collection of data pertaining to specific sample units. A sample is selected and information collected from individual sampling units. Data reported by the selected sampling units, when summarized (weighted), provides an indication of what the total would be for the whole population (all US farms).

Survey Period – The time period during which survey data collection can occur. Primarily determined by the survey's reference date and due date. See "Data Collection", "Date, Due", and "Date, Reference."

Tank Mix – Two or more pesticide products mixed in the spray tank by the applicator immediately before application an applied to the field as a single treatment.

Terrace – Raised level areas of a field supported on one or more sides by a wall or bank of turf. Terraces are usually classified by the method of runoff disposal, the shape of the terrace cross section, or by the alignment between terraces.

Underground Outlets – Systems of water runoff control carrying water through and underground pipe to disposal areas. The underground outlet consists of vertical intake risers carrying water to an underground outlet such as tile drainage.

Wetlands – Land characterized by an abundance of moisture and is inundated by surface or ground water often enough to support a prevalence of vegetation adapted for saturated conditions.

Wetting Agent – Some soils, known as hydrophobic soils, are difficult to wet because they repel water. The infiltration of water into these soils can often be improved by applying a nonionic surfactant, more commonly called a wetting agent. Wetting agents are detergent-like substances that reduce the surface tension of water, allowing it to penetrate and wet the soil more easily.

Worker – [Labor] Person doing work.

Yield Goal – The yield that the operator uses in planning input application (seeding rate, fertilizer/pesticide use, etc.). This is often the historic average.

Yield Map – A map prepared from data collected by a yield monitor attached to harvesting equipment. A yield map shows the variation in yields for small areas within a field and is a key component in the detailed planning inherent in precision farming.

Yield Monitor – A monitor mounted on harvesting equipment that measures yields continuously as the harvester moves through a field. These yield measures can be tied to specific locations in the field through GIS and converted into yield maps. Such yield maps can then be compared with the fertilizer or pesticide application map of the next season.

Chapter 3 - Survey Procedures

This chapter provides an overview of the questionnaire and other materials for ARMS, and general guidelines for collecting data. The NASDA Enumerator Handbook covers administrative matters.

At a minimum, the NASS Regional Field Office will provide the following:

- Copies of pre-survey publicity materials mailed to each respondent
- Questionnaires with labels identifying assigned operations
- Extra questionnaires without labels
- Respondent Booklets containing code tables and a burden statement
- Supplements for questionnaires
- Maps for marking field locations
- Envelopes for mailing completed questionnaires

You should already have these items on hand:

- Interviewer's Manual
- Highway and street maps
- Black lead pencils
- Name tag
- NASDA Identification Card
- NASDA Enumerator Handbook
- Calculator

Questionnaire

For 2017, there are five questionnaire versions used to obtain chemical use and other production practices along with associated cost of production data: Version 31, the Winter Wheat Production Practices and Costs Report (PPCR), Version 32, the Durum Wheat Production Practices and Costs Report (PPCR), Version 33, the Spring Wheat Production Practices and Costs Report (PPCR), Version 77, the Soybeans Production Practices Report (PPR) and Version 79, Cotton Production Practices Report (PPR).

Some questionnaires will have a Screening Supplement form inserted in the questionnaire by the Regional Field Office. Chapter 4 of this manual provides instructions for completing the Face Page and Screening Supplement.

Sections of the questionnaire are identified by letter and title. For example, Section D is "Pesticide Applications -- Selected Field." Chapter 5 discusses these sections.

Respondent Booklet

You will use one Respondent Booklet for each interview. The Respondent Booklet provides information respondents need to reference when answering some survey questions, such as Code Lists. Often, this information does not appear in the questionnaire. Using the Respondent Booklet can prevent confusion and save interview time.

Occasionally, the respondent may need help in becoming familiar with how to use the booklet. This is especially important when using the longer Code Lists, such as the Chemicals and Pesticides list. While conducting the interview, take a moment when first turning to a questionnaire section to show respondents how to reference the appropriate code lists in the booklet. This should help the interview go more quickly.

Some lists in the Respondent Booklet are there to let the respondent know what type of response we are looking for to certain questions. For example, in Section C or D, when asking the respondent "How was this (fertilizer or pesticide) product applied?" show the respondent the Fertilizer/Pesticide Application Method Code List printed in the Respondent Booklet. Otherwise, the respondent may take additional time explaining in detail how he applied the material, when all you really wanted to know was that the material was "broadcast by aircraft" (method code 3).

Respondent Burden

You will reduce the burden on the respondent if you are thoroughly familiar with the questionnaire and instructions. Pay close attention to skip instructions in the questionnaire to avoid asking questions needlessly. When skip instructions are not printed after an item, you will continue with the next item.

Also, be aware of the estimate of average completion time in the Burden Statement. The estimated average completion time is based on experience with previous ARMS Phase II surveys and the judgment of NASS and the Office of Management and Budget (OMB). OMB is an agency that approves all surveys conducted by the federal government. The expected average interview length for the PPCR is 65 minutes and the expected average interview length for the PPR is 35 minutes. Burden statements are printed on the front cover of the Respondent Booklet.

Questionnaire Format

The following formatting conventions apply to the ARMS Phase II questionnaire:

Interviewer Instructions

Interviewer instructions are printed in italics, and enclosed in square brackets. These instructions will provide important directions you will need to pay attention to when completing the questionnaire.

Figure 1 Example of interviewer instructions

2017

	TOTAL PLANTED ACRES
1. **How many acres of wheat did this operation plant for the 2017 crop year?** [*If no acres planted, review Screening Survey Information Form, make notes, then go to item 4 on back page*].	0050 .___

Include Statements and Check Lists

Include statements and check lists are used to ensure that items sometimes forgotten are not missed. These include statements and check lists should NOT be considered complete lists of items to be included in the response.

Text Fill-ins

Questions in table headers frequently refer to text in the rows used to FILL IN the wording of the question. In this example, the question to ask is "Please report the data collection technologies you used on this field to produce this crop."

Figure 2 Example of a 'text fill-in' question.

Please report the data collection technologies you used on this field to produce this crop. Also indicate if the data is collected with Global Positioning System (GPS) coordinates and if the data will be used to create a map.

1 Data Collection Tool	2 Tool Used YES = 1	3 Collected with GPS YES = 1	4 Data was/will be used to create a map Yes = 1
a. Yield monitor.	2461	2462	2463

Instructions for Respondents

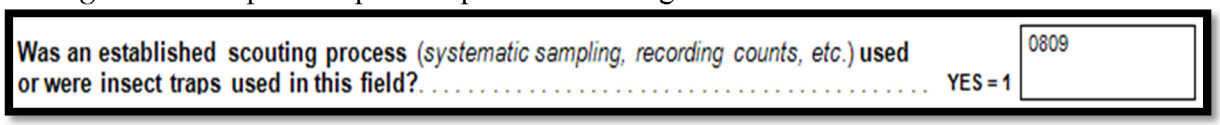
Prompts, "includes" and "excludes," and other instructions for respondents are in italics and enclosed in parentheses. These prompts are to help you and the respondent when a question arises as to the intent or meaning of the question. Read these when needed to clarify the meaning of the question.

Figure 3 Example of instructions to read to respondents

Optional Wording

Optional wording is in plain print enclosed in parentheses. Usually, reading optional wording is not necessary. However, if the respondent hesitates or shows uncertainty after hearing the initial question, you may want to reread the question completely, including the optional wording.

Figure 4 Example of 'optional question wording'.



Item Code Boxes with Decimal Points

Some code boxes have a printed decimal point followed by one or two marked spaces. They show that you should record data to the tenth or hundredth place. When entering data into these cells, place the number correctly in relation to the decimal points, and fill every space printed after them. Fill in zeros when the respondent does not give answers to the number of decimal places needed, or when he gives answers in whole numbers.

For example, if a cell has a decimal point followed by two underlined spaces, you should record responses in HUNDRETHS. Record an answer of "18" as "18.00."

Figure 5 Example of code boxes for recording data to one or more decimal places.

Item Code Boxes for Recording Dates

Some item code boxes are set up for recording dates in MM DD YY format. These cells have six preprinted underlines. MM stands for the two digits that refer to the month, DD is for the two digit date for the day, and YY is for the two digits for the year.

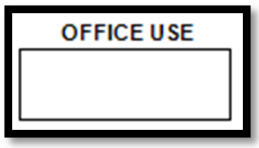
For example, May 1, 2017, should be entered as 0 5 0 1 1 7

Figure 6 Example of a code box for recording a date value.

Office Use Boxes

Office Use boxes are labeled throughout the questionnaire. You will not make entries in office use boxes.

Figure 7 Example of an 'office use' box.



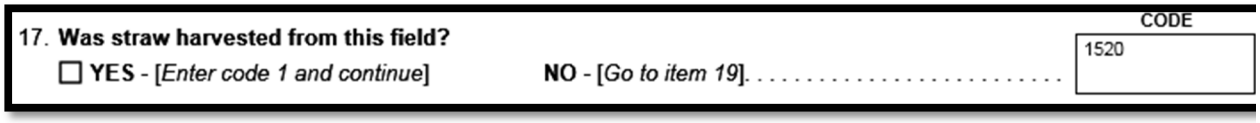
Yes/No Questions

Questions that can be answered YES or NO are of one of the following two formats. If the respondent doesn't know if the answer is YES or NO, then record DK next to the code box. If the respondent refuses to answer, then record "REFUSED" in notes outside the box.

YES/NO Check Boxes

One format for YES/NO questions is to use check boxes. Check boxes are used when there is a "GO TO" instruction associated with either the YES or NO answer.

Figure 8 Example of a Yes/No check box question.



YES=1 Boxes

Another format for YES/NO questions is the response code YES=1 printed next to the code box. If the answer to a YES/NO question is YES, enter code 1. If the answer is NO, then enter a dash in the box to show the question was asked and the respondent answered NO. Since you are not entering a number for NO, this is the only way to show you asked the question, and the answer was NO.

Figure 9 Example of a 'YES=1' question.

Multiple Choice Questions with Coded Response Categories

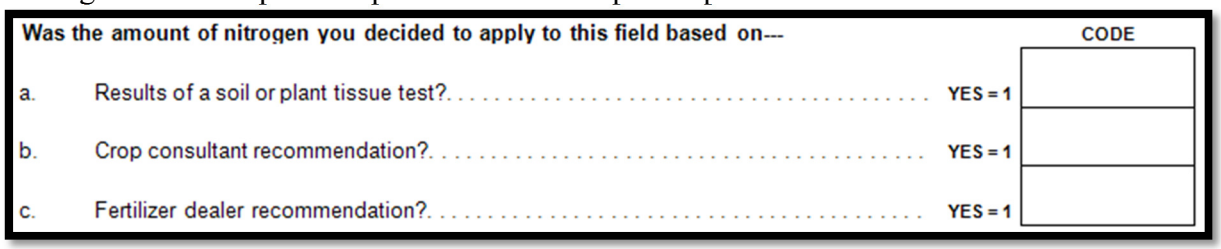
Multiple choice questions allow the respondent to choose only ONE answer from several possible answer choices offered. Each response category is given a code number and the group of answer choices is enclosed in a box with a solid outline. You will enter the respondent's answer as a code number.

Figure 10 Example of a question with coded response categories.

Questions with More than One Sub-part

Questions with more than one sub-part are separate questions. The main question (the "stem") has an item number. Sub-parts to the question are identified with a lower-case letter. Each sub-part is a separate question and must be asked separately. You should read the question stem followed by the ending sub-part associated with the letter. If there are lots of sub-parts, you will probably only need to read the stem for the first two or three sub-parts. Once the respondent understands that the stem is repeated, though unspoken, then continue reading only the sub-parts.

Figure 11 Example of a question with multiple subparts.



Entering Data

Use a black lead pencil to record data and notes; never use ink on a questionnaire. Make all entries clear, and easy to read. Entries in check boxes and item code boxes must be entirely inside the boxes.

Responses should be recorded in the unit shown in the questionnaire (such as acres, bushels, or dollars). If a respondent gives an answer in a different unit, write the answer outside the printed box, convert it to the required unit, and record the converted data in the box.

If the respondent answers "none" to a question, enter a dash (-----) in the box, and not a zero.

For questions answered with a code number, enter the number that goes with the respondent's answer. If the respondent answers using only the code number, verify that the code is correct by repeating the answer in words.

For YES/NO questions, enter code 1 if the answer to the question is YES. If the answer is NO, most often you must enter a dash in the box to show that you asked the question and the respondent answered NO. Since you are not entering a code number for NO, this is the only way to show that the answer was NO.

The Regional Field Office must be able to tell the difference between questions asked and the answer was NO or ZERO, and questions asked, but the respondent could not answer (DK) or did not answer (REFUSED). For any question, if the respondent doesn't know the answer, then record DK or "DON'T KNOW" next to the question. If the respondent refuses to answer, write "REFUSED" next to the question.

Record data to the nearest whole number, unless a decimal point is in the box. Place numbers correctly in relation to decimal points, and fill in every space printed after them. Use zeros as fill when answers are not given to as many decimal places as required by the data cell.

If answers appear unusual, but really are correct, make notes in the margins to explain. Do not write notes or make unnecessary entries in answer boxes.

Planning Your Work

The operator or operation name, mailing address, and ID number are on the questionnaire label. The Regional Field Office may provide other information, either on the label or on separate forms that might be helpful to you in finding the selected operation.

Mark the location of each operation assigned to you on a highway map before you start to interview. Show the location by a small circle with the ID number written beside it. Use this map to plan your daily travel; this will help keep travel expenses down and save time.

You may need to ask Post Office or Farm Service Agency employees for directions to some operations. Try to do this early in the survey so you can put the information on your map when possible. Mapping search engines on the internet such as

"MAPQUEST" located at www.MAPQUEST.com, are also valuable tools which can be used in locating farm operators. Tell your Supervisor about any operator whose home or office you cannot find.

Interviewing

Interview the farm operator, if possible, because information collected from other people is often less accurate. If the operator says someone else is more knowledgeable, interview that person.

If the operator is not present when you visit, but is expected soon, wait for the operator, or make other contacts nearby and return a little later.

If the operator is too busy to be interviewed at that time, set up an appointment at his or her convenience. Be sure to keep the appointment, and be on time! If an emergency prevents you from keeping the appointment, inform the operator beforehand and reschedule the interview.

If the operator will not be available before the survey is over, try to interview someone who is well informed about the operation. A partner, family member or an employee may know enough about the aspects of the farm operation covered in the questionnaire to give you the information needed.

The NASS rule-of-thumb is to make up to three visits (the first visit plus two call backs), if necessary to get an interview. If you have an appointment or information from a neighbor on when to try to reach the operator, you should return then. If not, make each visit at a different time of the day or evening.

Respondents often ask how long the interview will take. Never contradict the Burden Statement printed on the Respondent Booklet; however, adding to it is okay. For example, you might say something like this: "The official nationwide average for this survey is 65 minutes, but the interviews I have done in this area averaged about *xx* minutes." Be honest about the average time, even if your interviews average longer than the time estimate in the Burden Statement.

Encourage respondents to have farm records at hand. Using records encourages accurate information and completing the interview will take less time.

The first time you ask a question, always read the question exactly as worded in the questionnaire. If the respondent did not hear or did not understand the question, repeat it using the same wording. Use any optional wording or explanations printed with the question in the questionnaire. If the respondent still doesn't understand, or

asks you to explain, use what you learned in training and information from this manual to explain what we need.

Ask questions in the order they appear in the questionnaire. Do not skip any questions unless skip instructions printed in the questionnaire allow you to do so. Sometimes, a respondent will volunteer information before you ask a question. When you get to a question the respondent already answered, take the opportunity to verify the information. Say something like, "I think you told me this earlier, but let me just be sure I got it right." Then, ask the question exactly as worded. This doesn't make you look like you weren't listening. On the contrary, it emphasizes to the respondent the need to get things right.

Sometimes you will need to probe to get an adequate answer to a question. You should probe when the respondent cannot answer the question, when the answer isn't exact enough to record, when you think the answer may be incorrect because it doesn't fit with information you've already obtained, or when you think the respondent didn't understand the question.

The purpose of probing is to verify unusual data or to correct misreported data. You must be careful when you phrase your probing questions that you do not influence the respondent's answers. Probes should be "neutral," that is, they should not suggest one answer over another.

For example, don't say things like, "Use beneficial organisms in this field, you didn't do any of that, did you?" Instead, say, "Did you use any beneficial organisms to control pests in this field?" If the respondent asks for more information, explain that, "Beneficial organisms include insects like green lacewings or ladybugs that are natural enemies of crop pests."

As another example, if a respondent tells you that a value is between two amounts, such as, "Oh, I used a seeding rate of between 1 and 2 bushels per acre," you should ask, "Would you say it was closer to 1 bushel per acre or 2 bushels per acre, or what amount exactly?"

Probes should also be "nonthreatening." Be careful that you don't appear to be questioning or challenging the respondent's answers. Don't say, "That can't be right, three bushels of seed per acre is way too much!" Instead, say, "Does that three bushels include replanting? I only want the seeding rate for the first time the field was planted." Make corrections to data items if necessary or make notes of the respondent's answer if it is correct.

Be sure to make good notes. This is especially important when you find unusual

situations or the respondent explains why information that seems incorrect is correct. Also, write down any complicated calculations you have to make to come up with an answer.

The notes you record in the questionnaire will help the survey statistician understand this operation when reviewing the questionnaire. Make sure the notes are clear and can be read. Notes can be the single most valuable editing tool available to the office statistician.

Never erase a note unless it is wrong!

After completing each interview, be sure to review the questionnaire while the interview is still fresh in your mind. Make sure you recorded all answers correctly and the questionnaire is complete. Check your calculations. Make sure all notes are clear.

Framework and Reference Period for Reporting Data

The ARMS questionnaire is designed to collect information about production practices used and expense items associated with the 2017 crop of the randomly selected field or block. Many of these expense items should be reported in the dollar per acre cost for the selected field or block.

Fertilizer and pesticide data cover a period of immediately after harvest of the most recent crop (before this year's target crop), and continue through all applications made for this target crop. Post-harvest pesticide applications to the harvested crop are excluded.

Field operations data are reported beginning with the first tillage operation after removal of the most recent crop before the 2017 target crop from this field, and ending with the harvest and hauling of the 2017 crop to storage or first point of sale.

Non-response

If you are unable to conduct an interview, note the reason on the questionnaire. Also, make a note about whether the operation is a farm, whether it appears any of the target commodities were grown, and any other information you think might be helpful to the RFO.

Most farmers are willing to furnish the information asked for in NASS surveys, but in every survey some will refuse to do so.

The key to reducing the chances of getting refusals is to be courteous and friendly, but persistent. Try to get cooperation by explaining the purpose of the survey, the need for accurate agricultural statistics, and the confidentiality of the data. Make use of materials explaining the survey purpose provided by your RFO.

Above all, do not become discouraged when you get a refusal. Continue to meet farm operators with ease, friendliness and optimism as you contact other assigned operators.

Supervision

Your supervisor will set up an appointment to meet with you early in the survey. This visit will help you get off to a good start by spending time reviewing a few of your completed interviews. Hold all your completed work until this review takes place, unless your supervisor tells you to do otherwise.

Your supervisor or someone from the RFO will contact a few of your respondents to conduct a quality check. The quality check will verify that you spoke with the person named in the questionnaire and that the respondent understood the survey procedures.

Completed Questionnaires

Turn in your completed questionnaires according to the instructions you receive from you supervisor. If you think the last few questionnaires you complete might not reach the RFO before the final due date, call your supervisor.

Keep a record of when you complete each questionnaire and when you passed it on to your supervisor or mailed it to the RFO. This will help the RFO find survey materials if they are delayed.

Chapter 4 - Screening

Face Page

Introduction

Before beginning data collection, develop an introduction you are comfortable using. In the introduction include who you are, whom you represent, and the purpose of the visit. You should be familiar with the information in Chapter One of this manual.

Some operators may have already heard about the ARMS on radio or television farm show broadcasts or short spots. They may also have read about the survey in a pre-survey letter from your Regional Field Office or in newspaper or farm magazine articles.

When making your introduction, remind the respondent that data they report will be kept strictly confidential. All information they provide will only be used to make state, regional, and national estimates. Mention that some farm records, particularly records of fertilizer or pesticide applications, will be useful along with any notes or records of when field operations took place.

Be prepared to answer questions the respondent may have about the purpose of the survey and uses of the data.

Target Name, Address, and Partners Verification

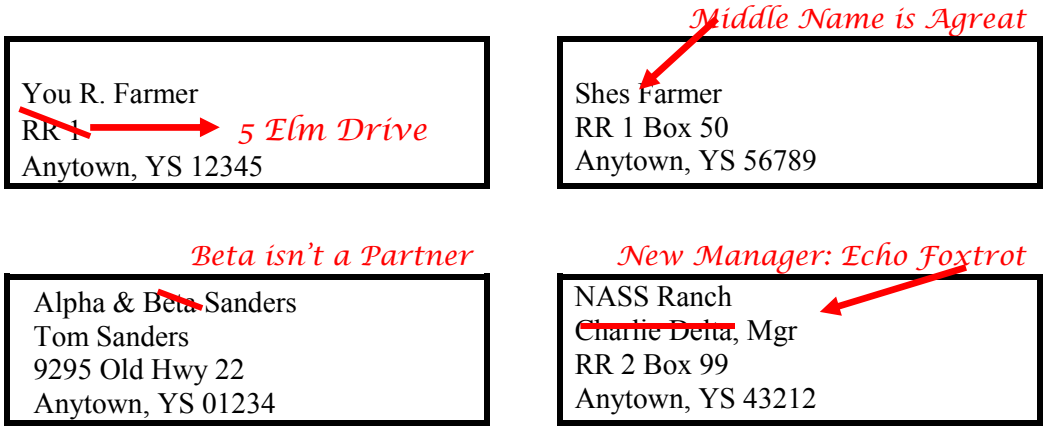
All questionnaires will have one or more labels. If an individual's name (IMA FARMER) appears under the ID line and the first line is blank, this is the Target Name (unless the opDomStatus is 99). If the first line contains a combination of individual names (IMA AND YOUREA FARMER) or an operation name (NASS FARMS), then the individual's name on the next line down is the Target Name.

If the opDomStatus is 99, then the name of the operation shown below the ID line is the target name.

Remember: The Target Name for OpDomStatus 99 NEVER CHANGES. The person operating the farm (the farm operator) may change, but the Target Name is always the Operation identified on the label.

The first thing you will do is verify the name and address for the target name. If there are partner labels, be sure that partner names and addresses are correct, and that all partners are listed. Mark through the names of any partners no longer involved in the operation. Record the names and addresses of any partners who are not listed.

Examples of common corrections are:



Screening Survey Information Form

Operations sampled for ARMS Phase II were interviewed during the Screening Survey. The Regional Field Office will insert a Screening Survey Information Form inside the questionnaire with information collected during the Screening Survey interview.

The Screening Survey Information Form shows:

- type of operation reported (individual, partnership, managed).
- who reported on the Screening Survey.
- how the screening data was obtained.
- the ID for the enumerator who conducted the screening interview.
- the sequence (sample) number. This number also appears on the ID label. This sequence (sample) number is used in marking field locations on maps.

Verify the type of operation listed on the Screening Survey Information Form is still correct, particularly if you made corrections to the name, address, or partners on the Face Page.

Beginning Time

Record the beginning time (military) of the interview when the respondent

agrees to cooperate on the survey and you actually start the interview. We use interview times to find out how much respondent time we are using (as a measure of respondent burden) in collecting data. We are trying to reduce interview times as much as possible and still collect the high quality data that we need.

Screening Box on Face Page

The Regional Field Office may want you to re-screen the target operation by asking the screening questions again. This may be because the respondent to the Screening Survey may have been someone other than the operator, or incomplete information was obtained on the Screening Survey (for example, partner information was not collected).

If the Screening Box (cell 0006) on the Face Page is coded with a "1", the RFO will include a Screening Supplement for you to complete. Complete this supplement after verifying the name and address labels on the questionnaire, but before you begin asking questions in Section A of the questionnaire.

Back Page

Response Codes

Upon completion of the interview, enter the response code in cell 9901 on the Back Page of the questionnaire. Response codes are:

Code 1 - Complete	• The questionnaire is complete, including questionnaires for respondents that are no longer in business. • Use Response Code 1 for operations that you have determined DID NOT grow the target commodity this year. Complete means you have obtained all of the data needed for the questionnaire. • Use Response Code 1 for institutional farms, such as prison farms, private or university research farms, high school FFA farms, not-for-profit farms operated by religious organizations, and Indian reservations produce agricultural commodities, but do not meet the ARMS definition of a farm or ranch. Production practices, costs, and income characteristics of these operations are not representative of the general farm population. Assign Response Code 1 to these types of operations, and describe the specific type of operation

	on the face page with a note. A screening supplement must be complete for institutional farms, assigning 9921=14.
Code 2 - Refusal	The respondent refused to cooperate or grant an interview.
Code 3 - Inaccessible / Incomplete	The operator was not available throughout the survey period (inaccessible). You will also use code 3 if the respondent gave an interview but could not or would not answer a lot of the questions (incomplete questionnaire). If you determine that the target operation does not produce the selected commodity, code the questionnaire complete (code 1) and indicate the source of your information with a note.

Completing the Screening Supplement

Farm operations in each State are sampled for the phase II of the ARMS based on list frame information about crop acreage and gross value of farm sales. Agribusiness firms and agricultural services that do not produce crops or livestock of their own should have been excluded from the sample, but it is possible some names were mis-classified. Screening questions help determine if the selected name is eligible for this survey.

Abnormal (Institutional) farms such as prison farms, private or university research farms, high school FFA farms, not-for-profit farms operated by religious organizations, and Indian reservations are excluded from the survey. Production practices, costs, and income characteristics of these operations are not representative of the general farm population. If your assignment includes any of these farms, notify your supervisor or the survey statistician.

If an operation was in business during part of 2017, but went out of business during the year, complete a questionnaire for the part of the year during which the operation did business. If the operation was taken over by another operator or operation when it went out of business, make a note of this. This note should include a name, address, phone number, and any other pertinent information about the new operation.

There is one version of the Screening Supplement. The supplement is used for opDomStatus 99 records and for the NON opDomStatus 99 operations. The supplement determines if the selected operation is in-

business for 2017 and obtains additional information about other operations the target name is involved in. The RFO will insert the supplement into the questionnaire for you to use if the operation requires re-screening in Phase II.

Item 1: Other Operation Name

Even though you have already verified the label, you need to ask this item to avoid duplication and to make sure the Regional Field Office sampling list is up-to-date.

Item 2: Crops, Livestock or Poultry

Check YES if the operation grew any crop (field crops, fruit/nut crops, vegetables, oilseeds, specialty crops, hay) or had cattle, hogs, sheep, poultry or other livestock during 2017 on the total land operated. If YES, go to Item 6. If NO, continue with Item 3.

For an operation to qualify as growing a crop, it must have made the decisions on planting, caring for and harvesting the crop.

Include: field crops, fruit and nut crops, vegetables, mushrooms, flowers, nursery stock, greenhouse crops, hay, Christmas trees, etc.

Exclude: home gardens, crops received in the 2017 crop year as payment for land rented to someone else, and crops grown by anyone other than the target name on land this operation rents to others.

This screening question would also be checked YES if the target name had any livestock or poultry, regardless of ownership, on the total acres operated at any time during 2017.

Include: All cattle, hogs, sheep, mules, goats, chickens, turkeys, ducks, geese, bees, rabbits, mink or other fur bearing animals, and fish that are raised commercially or for home consumption. FFA and 4-H livestock projects should also be included.

Exclude: Horse boarding operations, riding stables, or race horse training operations that do not have other agricultural items. Also exclude slaughter or packing houses, auction

barns, stockyards or order buyers. These operations have livestock which are committed for slaughter. The presence of these livestock alone does not qualify an operation for the survey.

Item 3: Sales of Agricultural Products or Receipt of Government Agricultural Payments

Include sales of crops, livestock, fish and other products from the total land in the operation. Include any government payments received under the 7-year market transition program, conservation programs, etc.

This item should be answered NO when the respondent is a landlord who only sells agricultural products from, or only receives government farm payments for, land which was rented out.

If this item is checked YES, go to Item 6.

If Items 2 and 3 are both NO, continue with Item 4.

Item 4: Out-of-Business Determination

If both items 2 and 3 are NO, then the selected operation is considered to be out-of-business for 2017.

Determine if anyone else is now operating the land formerly operated by the target name on the Face Page. Ask this item only if the respondent answered NO to questions 2 and 3. If another operation has taken over from the target name on the label, record the name of the operator or operation now operating the land.

This item gives us the information we need to update the List Frame when operations have gone out of business. Record the name, address, and phone number (if available) of the individual or operation now operating land that used to be operated by the target name. If the respondent answers NO to this item, probe to determine what happened to the land, and make notes.

Item 5: Enumerator Action

These instructions only apply in rare cases and the interview will not be conducted based on information recorded on the screening supplement.

If the operation is out-of-business, any data obtained in the questionnaire would be excluded from the summary process. Therefore, the interview should be ended before burdening the respondent to complete the questionnaire.

1. On the Screening Supplement, enter code “9" for the reporting unit in item 6 (cell 9921).

2. Go to the bottom of the Back Page and complete the following administrative items: Response code, Respondent code, Mode code, Ending Time, Date, and Enumerator ID.

Item 6: Decision-Maker for This Operation

This item is only completed if the operation is in-business for 2017 (item 2 or 3 is checked 'YES').

We are interested in how the operation was managed on a day-to-day basis. We do not care what the LEGAL definition of the operation is.

Definitions of individual, partnership, and managed land are printed in the Interviewer's Manual. Landlord-tenant, cash-rent and share crop arrangements should not be considered partnerships.

When an individual operation is reported, enter code 1.

When a partnership is reported, enter the number of partners. Include the person listed on the Face Page and all of the other partners.

When a manager is reported, enter code 8.

Item 7: Other Operations

This item is only completed for non-opDomStatus 99 operations that are in-business during 2017.

If the RFO already knows about additional operations associated with the target name, there should be labels for Operation 2 on the Screening Supplement. There will be an additional Screening Supplement for Operation 3, if there is a third operation.

This question determines if the target name made day-to-day decisions for any other operations in 2017. Each additional operation must be listed or verified on the back side of the Screening Supplement. Additional copies of the Screening Supplement should be used if there is more than one additional operation. The information collected on the Screening Supplement will be used to update your State's list sampling frame and to adjust the data collected in the questionnaire to represent multiple operations.

If the Operator Does Not Have Other Operations

If there were not any other operations, enter '1' in cell 0923, then go to Section A of the questionnaire and begin the interview.

If the Operator Has Other Operations

Item 7a - Total Number of Operating Arrangements

Enter the TOTAL number of operating arrangements, including the sampled operation labeled on the face page of the questionnaire in cell 0923.

Entering a "2" for this item indicates the operator makes day-to-day decisions for two operations (the one labeled on the Face Page of the questionnaire and one additional operation).

Item 7b - Identifying Additional Operating Arrangements

Complete or verify the names and addresses, including partners, for each additional operation. If the operator had a third operation, complete or verify the information on an additional Screening Supplement for this operation.

Mark out any operations the target name was not associated with in 2017. If any partner names are not listed, add them.

If the target name is involved (either as individual operator or as a partner) with any other operations which are not listed on a Screening Supplement, record these. In the partner space record the names of all of the partners other than the target name associated with each additional operation.

Item 7c - Day-to-day Decisions for Additional Operations

For each of the additional operations, check the appropriate box to explain how the day-to-day decisions were made in 2017.

We are interested in how day-to-day decisions were made for this additional operation, not the legal definition of the operation.

After obtaining names and addresses for all individuals involved in all additional operating arrangements, begin the interview with Section A.

Special Situations

Do not include operations not already listed for which the target name is a hired manager.

A special situation exists if the operation on the Face Page of the questionnaire is a managed operation. If the target name is still the hired manager, there is no problem; handle it as you would normally.

If the label for the operation on the Face Page is a managed operation and was still in business in 2017 under a new hired manager, you will contact the new hired manager and collect data for the operation named on the Face Page. You will also need to contact the original target name to verify any other operations listed, and if that originally selected target individual has additional operations you will list them on one or more Screening Supplement(s).

This page intentionally left blank.

Chapter 5 - Completing the Questionnaire

Overview

This section provides an overview of how Chapter 5 is organized. It also describes notations used in the chapter for guidance.

Chapter 5 contains question-by-question instructions for every item in every section of the questionnaires for Phase II. There are 5 questionnaire versions for 2017: Winter Wheat PPCR (V31), Durum Wheat PPCR (V32), Spring Wheat PPCR (V33), Soybeans PPR (V77), and Cotton PPR (V79). The ARMS Phase II questionnaire sections are listed in Exhibit 5.1 below at the end of this overview.

Questions may not have the same numbering but the instructions are the same on all versions. Particular questions do not appear in every version or are not asked for every target commodity. For these questions, notations are used to identify the version number and the crop:

1. The notation ***V#*** (in BOLD ITALICS) appears under the question item number in the question-by-question instructions in this manual. This indicates version(s) in which the question appears. For example, if the notation ***V31,*** appears, this indicates that the item applies only to Version 31.

2. The name of the Crop(s) for which the question is asked appears in *italics* beside the ***V#*** indication.

For example, the following notation indicates that the question only applies to questionnaire version 31 (Winter Wheat):

V31: Winter Wheat

3. **If there is no version notation, the question is asked in all versions.**

As you read the manual, refer to copies of your questionnaire(s). If you are working in a Region not doing a particular version, ignore instructions that do not apply to your Region.

Exhibit 5.1: Questionnaire Sections

Section	Section Title
A	*Target Commodity* Field Selection
B	Field Characteristics
C	Nutrient or Fertilizer Applications
D	Biocontrol or Pesticide Applications
E	Pest Management Practices
F	Field Operations
G	Irrigation
H	Conclusion

Section A - Target Commodity Field Selection

Section A Purpose

Field level samples supply the specific details needed for the economic and chemical use analysis for field crops. Each field must be randomly selected from all of the operation's fields of the target crop for the sampled field to be representative of all fields of the commodity of interest. Simple random sampling procedures are used for field selection.

Beginning with Section B, questions in the questionnaire refer *only* to the field selected in Section A.

Screening Survey Information

Your Regional Office should have inserted a **Screening Survey Information Form** into the questionnaire. This form will provide you with information reported during the ARMS Phase I. Information contained on the Screening Survey Information Form includes operation characteristics, total acres operated, and total target crop acres. The form is intended to assist you (and the respondent) in making sure the correct operation is reporting for Phase II. You should review this form prior to conducting the Phase II interview

Item 1: Total Acreage of Target Commodity

The target commodity is the commodity whose name is indicated on the questionnaire cover page, and the commodity to which the questions in each section refer. Enter the total number of acres of the target commodity that this operation planted for any purpose for the 2017 crop year. For wheat, the acreage of all types of wheat are listed in item 1, and the acreage of the specific type of wheat is distinguished in item 1a. The target commodity for each wheat interview is the specific type of wheat indicated on the cover page. This is the same for soybeans and cotton with the exception of 1a.

For version 33, other spring wheat, the target is all spring planted wheat that is not winter nor durum wheat.

Acres should be recorded in tenths (1/10) of acres. For example, 180 acres should be entered as 180.0.

INCLUDE:

1. All acres planted to the target crop, even if they were abandoned, grazed off, or cut for forage. We include these acres because the operator usually has expenses and chemical applications associated with them.
2. Acres planted to the target crop and later replanted to the same crop. If the operator had to replant some of the acres (poor seed germination and weather are common causes of replanting), count these acres only one time.
3. Target crop acres which were later plowed down and planted to some other crop for harvest.

EXCLUDE:

1. Acres planted on land operated by someone else. For instance, exclude acres planted by someone else who rents cropland from this operator.

Each sampled operator was screened for inclusion in ARMS Phase II based on data reported in a screening interview in May, June, or July. The number of target commodity acres reported in the ARMS Phase I was very important in determining which strata the operator would be sampled for Phase II and how estimates of production practices are ultimately made. If there are big differences between the target commodity acres reported during the Phase I and the Phase II target commodity acres, make notes on the Screening Survey Information Form to assist the survey statistician in editing the questionnaire.

There are many good, logical reasons why the Item 1 acreage may be different from the screened acreage. The information on the Screening Survey Information Form is useful for determining likely reasons for any differences. For example, the respondent to the Screening Survey may have been a different person from the respondent you are interviewing, or the acreage reported in the Screening Survey may have represented intentions to plant, and not acreage already planted.

Don't assume that something is wrong if the Screening Survey acreage differs from the acreage reported in Item 1. It may not be wrong, just different. You may tell the operator your notes from the Screening Survey conducted in May, June and July show the operation with "X" acres, and ask the operator to explain the difference. Make a note of the explanation on the questionnaire, or make corrections to Item 1 acreage, if necessary.

If no target crop acres are reported in Item 1, review the information on the Screening Survey Information Form. Make explicit notes about the reason why the current report of zero acres is different from the information reported on the Screening Survey Information Form. If the operator has no target crop acres, then go to Item 4 of the Conclusion, and conclude the interview. This is considered a 'complete' interview.

Item 2: Total Number of Fields

Item 2 asks for the number of fields planted to the target commodity on the total acres operated for the 2017 crop. Do not skip this question, rush through it, or accept vague estimates of the number of fields. It is absolutely essential that this question be enumerated correctly. The accuracy with which statisticians can make estimates from the one selected field to represent the whole commodity enterprise is seriously jeopardized if this item is incorrect. This total number of fields will be used to expand the field level data collected in this questionnaire.

If the operator had only 1 field of the target commodity, enter a "1" in Item 2 and a "1" in Item 4. Then go to Item 5 and explain to the respondent that the remainder of the questions will be about this specific field.

If the operator has more than 1 field of the target commodity, enter the number of fields in Item 2 and continue with Item 3.

In some instances, the respondent may begin listing the target commodity fields in order to determine a count of fields. If this happens, you should be prepared to enter the fields in Item 3 and then return to Item 2 to record the total number of fields. The important things to remember are: All fields must be listed to ensure a random selection; and, the total number of fields must be accurate to ensure the data are correctly expanded.

Item 3: Identification of Fields

Item 3 uniquely identifies every target commodity field. It is extremely important that all fields are listed and that the actual number of fields is accurately recorded in Item 2.

Ask the respondent to list the target commodity fields for the operation. **If there are more than 18 fields, list only the 18 fields closest to the operator's permanent residence.** Record each field on the lines provided in the questionnaire.

After listing all individual fields, the operator may report a more accurate number of total fields. In this situation, update the number of fields in Item 2 to reflect the correct number.

You may list fields in any order. Do not skip any lines when completing this listing.
Operators can list fields using any description that is meaningful to them. Some operations have a formal field numbering or naming system, but others may use informal names or descriptions for their fields. Many operators identify fields of crops using some combination of their location and acreage. Many refer to their fields by the name of the current or previous property owner. It does not matter what kind of field identification system is used, as long as the respondent can list the fields by names, numbers, or other description, and knows which field is which.

If the operator is unable to list the target commodity fields by name, number, or other description, use the field selection grid to draw off (up to 18) the operation's fields closest to the operator's permanent residence. The field selection grid is printed on a separate Field Selection Supplement.

Prior experience has shown the grid to be very beneficial in the rare cases when the respondent cannot adequately describe the fields without drawing them.

Item 4: Random Number Selection

If there is only ONE target commodity field (Item 2 is 1), enter "1" for Item 4 and go to Item 5.

If there is more than one field, you must use the **Random Number Label** to randomly pick one field to focus on for the rest of the interview.

The Regional Office will place a Random Number Label (see Figure 2 on page 5009) on the Field Selection page in each questionnaire. Read across the FLD (field) line to match the number of fields you listed in Item 2. On the SEL (selected) line immediately below the FLD line is the number of the randomly selected field.

Circle the pair of numbers on the label associated with the last numbered field line in Item 3. Write the randomly selected field number in Item 4. Circle the

randomly selected field in the Item 3 listing. This helps both you and the respondent identify the randomly selected field.

Practice this procedure until you are comfortable with using the Random Number Label. Randomness of field selection is another essential element in making accurate estimates for the whole target commodity enterprise from just one selected target commodity field.

Field Selection Grid Supplement

This procedure is rarely necessary, but there is a need to be prepared to use it so that the interview begins smoothly. The reason we use the field selection grid is to be able to list the respondent's fields systematically so that a single field may be randomly selected.

You will not need this procedure if the respondent has names or numbers for the fields, or is able to describe them. The exception may be when the operator has more than 18 fields, and it is difficult to identify the 18 fields closest to the operator's permanent residence.

Mapping Fields on the Field Selection Grid Supplement

Beginning with the target commodity field closest to the operator's residence, draw off the operation's fields. There is no need to draw off more than 18 fields, since the Random Number Label accounts for up to 18 fields. Sketch in any boundaries such as roads and rivers which may help you and the respondent locate the fields accurately. It may be helpful to use a county map along with the grid.

Do not spend a lot of time trying to make your map a work of art. Drawing to scale is not important, but the relative location of fields to the operator's permanent residence is important. The field furthest north should be nearest the top of the grid, and the field furthest west should be at the far left of the grid.

Once fields are drawn on the grid, you are ready to begin numbering them. Number the (up to 18) fields drawn from 1 to 18, and continue with the random field selection with the random number label.

Using Farm/Ranch Maps

If the respondent has a farm or ranch map for you to write on, locate and mark

(an X is fine) up to 18 of the operation's target commodity fields. Begin numbering the fields as you mark them. Remember, we are locating the fields closest to the operator's permanent residence. Continue marking and numbering up to a maximum of 18 fields per operation.

Some operators have copies of maps or aerial photos from their local county office of USDA's Farm Service Agency (FSA). The operator's fields are drawn off on these maps or aerial photos and identified with letters and numbers. These maps may also be helpful in the field selection process for this survey. On these FSA field maps, identify the operation's fields planted to target commodity, mark them, and number them, beginning with number 1. Or you may use the FSA letters and numbers when listing the fields in Item 4.

Whatever method you (and the respondent) use to number the fields, it is important that you and the operator can identify the selected field when you've completed field selection. Do not proceed with the interview until you are sure they can specifically reference the selected field.

Numbering the Fields

Begin numbering the fields. If there are 18 or less fields, you can number in any sequence you want. If there are 19 or more fields, number the 18 fields closest to the operator's permanent residence. However, the field closest to the residence does **not** have to be "1", and the next closest "2". You only need to list the closest 18 fields to the residence.

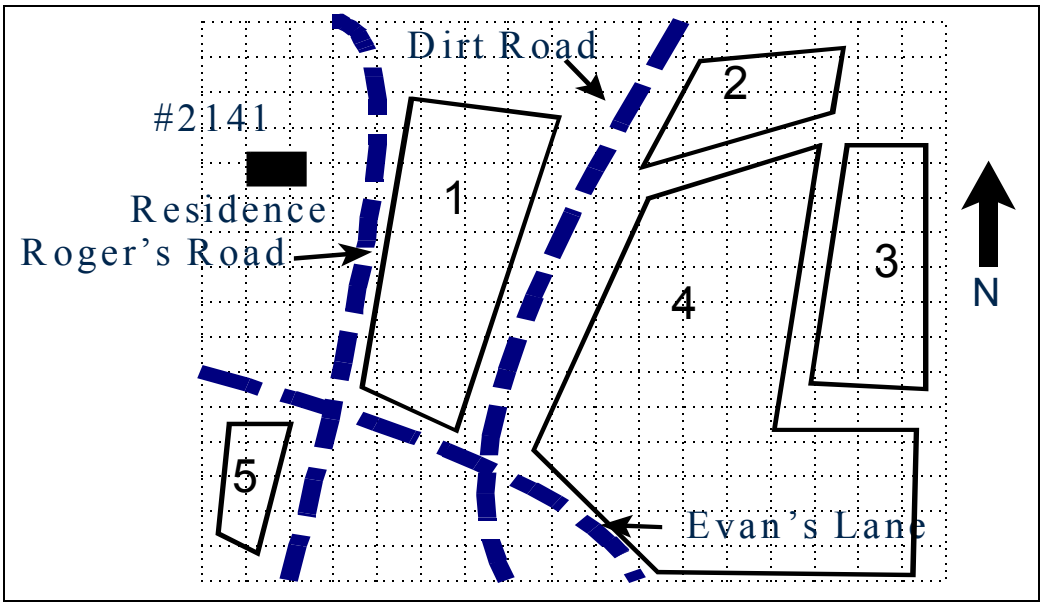


Figure 1 Mapping Fields on the Field Selection Supplement

Example 1: Random Field Selection

The respondent tells you that there are 5 fields of the target commodity on the operation, but does not have identifying names or numbers for them. The respondent does not feel confident about describing them very well, but says drawing them would help. Refer to Figure 1.

1. For Item 2, enter "5".

2. Get a Field Selection Grid Supplement. Copy the ID, Tract and Subtract from the questionnaire to the supplement and enter the commodity name.

OR You may use a map of fields supplied by the respondent.

3. Draw the 5 fields on the grid (or map) in relation to the operator's residence.

4. Number the fields drawn on the grid (map). Continue with Item 3, and list the 5 fields as the respondent identifies them.

5. Locate the number 5 on the FLD line of the Random Number Label (Figure 2).

Target Commodity									
FLD:	1	2	3	4	5	6	7	8	9
SEL:	1	2	2	4	1	5	7	6	2
FLD:	10	11	12	13	14	15	16	17	18
SEL:	5	6	10	9	10	14	11	8	16

Figure 2: Example of a Random Number Label

6. Circle the pair of numbers on the label associated with the number 5. For this example, the random number selected is '1'. The target commodity field listed on line 1 of Item 3 is selected as the random field. Circle field 1 in the Item 3 listing and on the grid (or map).

7. Record the randomly selected field number, field 1, in Item 4.

8. Identify this field for the respondent as the selected field for this interview. Be sure that the respondent knows which field this is. Tell the respondent that most of your questions will be about this selected field, and that these questions should be answered with information about this field only.

   It may help the respondent to stay focused on the selected field if you refer to it occasionally during the interview using the same description reported to you. For example, when you originally listed the operation's 5 fields of the target commodity, the respondent called field #1 "45 acres on Smitty's." Several times during the interview, refer to this field using these same words. For example, when you ask Item 1 in Section C, say, "Were commercial fertilizers applied to these 45 acres on Smitty's for the 2017 target commodity crop?"

Item 5: Informing Respondent of Field Selection

Tell the respondent which target commodity field is selected, and be certain that both of you can identify that field.

For the remainder of the interview, the respondent must be able to focus on the selected field, and provide you with information for only that field.

Item 6: Farm, Tract, and Field

Ask the respondent if they can identify the farm, tract, and field, of the randomly selected field that they signed up with the Farm Service Agency (FSA). If the operator does not know this information, continue to the next section.

These numbers are the administrative identifiers for the field that USDA uses in administering a wide variety of farm programs such as crop insurance, commodity programs, and conservation programs. The numbers are like an address for each field. The Farm Number is from one to eight digits and is unique within a county. Note that many farm operations contain multiple FSA farm numbers, but each field is associated with only one FSA farm number. The tract number is from one to seven digits and is unique with a farm number. The field number is from one to four digits and is unique within a tract. Administrative units call "subfields" are indicated using a letter. Please do not include the subfield indicator. If the physical field in this survey spans multiple FSA administrative fields, please include the farm, tract, and field number for the largest administrative field. The survey asks about these questions so that outside data – such as information on conservation practices under working lands programs and spatial data such as detailed soil characteristics – can be linked to the survey data. This allows researchers using the ARMS data to more accurately identify drivers of production decisions and costs."

Item 7: Randomly Selected field is Target Commodity

Verify that the randomly selected field was planted with the target crop. If selected field is not the target crop, go back to item 2 to collect target crop fields. For wheat, this means ensuring that a wheat field of the specific type of wheat being sampled, either winter, durum, or other spring wheat, was in the selected field.

Section B - Field Characteristics

Section B Purpose

Section B obtains information used to calculate cost of production per planted acre on the selected field. If a crop is planted, some costs are incurred, regardless of whether the crop is harvested or not.

Data from Section B are also used to study land tenure, conservation practices, and adoption of new technologies such as genetically modified seed technology.

In some parts of the country, it is common to let land lie fallow (no crop harvested) for an entire season to conserve moisture and/or improve soil quality. In calculating cost estimates, fallow land incurs a cost which is assigned to the crop following the fallow period. If the fallow acres are planted to a cover crop, the cost of the cover crop seed is also considered in updating cost of production estimates. In non-survey years, knowing the cover crop allows ERS to adjust cover crop seed costs.

Seeding rate is needed to determine the cost of planting the target commodity. The seeding rate allows ERS to adjust seed expenses between survey years.

Previous crop data provide information on cropping patterns, important in analyzing fertilizer and pesticide use. In addition, USDA is required to evaluate conservation tillage systems. The previous crop is used in conjunction with the machinery data collected in Section F to estimate residue levels and determine tillage systems. The resulting information is used to evaluate soil erosion losses and water quality.

Note: Questions in this section pertain to Version 31: Winter Wheat, Version 32: Durum Wheat, and Version 33: Spring Wheat.

Item 1: Field Acres

Enter the number of acres **planted** in the selected target commodity field. Round to nearest tenth (1/10) of an acre. Exclude areas of waste, roads, and ditches that are not planted to the target commodity crop. Do not double count for any acreage that had to be replanted.

Item 1a: Certified Organic Acres

Organic refers to the way agricultural products—food and fiber—are grown and processed. Organic food production is based on a system of farming that maintains and replenishes soil fertility without the use of toxic and persistent pesticides and fertilizers. Organic foods are minimally processed without artificial ingredients, preservatives, or irradiation to maintain the integrity of the food. "**Certified Organic**" means the item has been grown according to strict uniform standards that are verified by independent state or private organizations. Certification includes inspections of farm fields and processing facilities, detailed record keeping, and periodic testing of soil and water to ensure that growers and handlers are meeting the standards which have been set.

Organic farming standards differ fundamentally from conventional ones in their primary focus on management practices that promote and enhance ecological harmony. Certified organic crops cannot be seeded with genetically modified seed nor treated with synthetic fertilizers or pesticides.

If the target commodity in the selected field was planted with the intention of being harvested as certified organic, enter a "1".

Item 1b: Organic Certification Cost

If the selected field is certified organic, ask for the cost per acre incurred for third party organic certification. In order to produce organic crops, the farmer must have a plan for managing the crop acreage according to rules of the National Organic Program (NOP), and the plan must be certified by a certifier authorized by the NOP.

Item 2: Tenure Arrangement

This item is used to determine the cost of land for crop production, and whether production practices used for owned fields differ from those on rented fields. In most cases, the entire field will either be owned, rented, or used rent free.

Record the appropriate code for the type of tenure arrangement. If the field contains acreage of different tenure types, **record** the code that reflects the tenure of the majority of the acres in the field.

RECORD:

- Acres in the field which are owned by the operation (**CODE=1**).

- Acres in the field for which the operator paid a predetermined fixed cash rent (**CODE=2**).

- Acres in the field for which the operator paid a flexible cash rent (**CODE=3**). The cash rent may have depended upon the resulting yield, market price, or some other factor.

- Acres in the field for which the operator paid the landlord a share of the crop (either standing or harvested), (**CODE=4**). Include acres planted on share rented land, even if the crop was plowed under or abandoned and, therefore, the landlord's share was zero, as long as the rental agreement specified the rental fee was to be a share of the crop grown.

- Acres in the field for which the operator paid some combination of cash and a share of the crop (**CODE=5**). The rent may include a fixed or flexible cash payment supplemented with a share of the crop.

- Acres in the field belonging to others (private individuals, federal, state, railroad, etc.) which the operator used rent free (**CODE=6**). If the rental agreement specifies the landlord only receives a share of the government payments, and no share of the crop, then this should be counted as land used rent free.

Item 3: Cash Rent Paid

If the selected field is cash rented (**Item 2 = 2, 3 or 5**), ask how much was paid in cash rent.

Record cash rent in dollars and cents per acre. If this figure cannot be obtained, ask for the total dollars paid in cash rent and calculate the cash rent paid per acre for the field and write in a comment indicating how this figure was calculated.

Item 4: Landlord's Share of the Crop

If the selected field is share rented (**Item 2 = 4 or 5**), **record** the percent of total production from the selected field that the rental agreement allocates to

the landlord.

If the crop failed or the field was abandoned, **record** the percent of the crop the landlord would have received (based on the original rental agreement) had the crop not failed in Item 4.

Item 5: Cost of Inputs Provided by Landlord

If the selected field was rented (**Item 2 = 2, 3, 4, or 5**), the landlord may have paid some of the variable costs associated with producing the crop. Sharing costs is more common with share-rented land, but it can happen in cash or rent-free rental arrangements.

This question obtains variable expenses paid by landlords to produce the target crop. Landlord costs should also be included in the variable expense items asked in other sections. This question identifies how much of that cost was paid by the landlord. This information is primarily used to establish the value of land under share rental arrangements. In share rental arrangements, the value of the land for crop production is computed as the value of the landlord's share of the crop less costs paid by the landlord.

Ask the respondent for the total cost of all inputs provided by any landlord(s) for all or part of for the 2017 selected target commodity field.

If the field has more than one landlord or contractor, **record** the total dollars or dollars and cents per acre paid by all landlords.

If the landlord(s) did NOT pay any of these costs, skip to item 6.

Item 6: Cost of Inputs Provided by Contractor

This question obtains variable expenses paid by contractors to produce the target crop. Contractor costs should also be included in the variable expense items asked in other sections. This question identifies how much of that cost was paid by the contractor. This information is primarily used to establish the value of land under share rental arrangements.

Ask the respondent for the total cost of all inputs provided by any contractor(s) for all or part of for the 2017 selected target commodity field.

If the field has more than one contractor, **record** the total dollars or dollars and cents per acre paid by all contractors.

If contractors did NOT pay any of these costs, skip to item 7.

Item 7: Year Began Operating Field

Analysts are interested in the effect of land ownership on the adoption of long-term practices such as terracing and building levees. These items, along with information on wetland notification by NRCS, provide information needed for this analysis.

Record the year **this operator** began operating land inside the field. Do not list the year that any member of the family began operating this field (i.e., this year should be after the farmer was born). If part of the field is owned, and part is rented, enter the earliest of either the year of the lease arrangement or when the part of the field was purchased. If 2017 was the first year the field was farmed by the operator, enter '2017'.

Item 8: Planting Date

Record the date the selected field was planted. If the field was replanted to the target commodity, record the date the field was planted the first time. If more than one day was needed for planting the field (the first time), enter the date planting was completed. If the operator does not know the planting date, ask what week the field was planted. Then enter the date for the WEDNESDAY of that week.

Record month, day, and year, in digits. For example, May 23, 2017, will be entered as 0 5 2 3 1 7.

Item 8a: Yield Goal

Estimates of producer yield goal compared with actual yield gives some indication of how realistic producer's expectations are. Recommended fertilizer application rates are often based on the yield goal of the producer. It also gives an indication of how unexpected conditions, such as droughts or pest infestations, may have affected yields. Furthermore, assessing the impact of adopting different nutrient practices requires information on the producer's pre-season expected yield or yield goal which can be much different from actual yield.

Item 8b: Harvest Intention

Enter the code that best describes the operator's planting intention. Enter a '1' if the field was intended for both grain and grazing, enter a '2' for harvesting for grain only, enter a '3' if for grazing only, and enter a '4' for cover crop. If the operator had intentions for any other use, enter code '5' and specify the use.

Item 9: Seed Source

Record the source of the seed used on the selected field. Use the following response categories:

Code 1: Purchased	This is seed that was bought from a seed dealer or another operator.
Code 2: Homegrown or Traded	"Homegrown" is seed grown on the farm by the respondent and used for planting the selected field in 2017. "Traded" is when the operator received seed with no cash changing hands, such as swapping use of harvesting equipment with a neighbor for seed in return.
Code 3: Both	The operator used both homegrown or traded AND purchased seed to plant the selected field. If both were used on the farm and the operator cannot determine which was used on the selected field, use code 3.

Item 9a: Cost of Cleaning and Treating Seed

Homegrown or traded seed may have been cleaned and treated with an insecticide or fungicide prior to planting. Record the cost of this seed cleaning and treatment in dollars and cents per bushel. **Exclude** the cost of chemicals applied at planting time; these will be obtained in the Pesticide Applications section.

Item 9b: Amount of Homegrown or Traded Seed

If any of the seed used was grown on this operation or traded, then record the amount of homegrown or traded seed used in the selected field expressed as a percent of seed planted. If only homegrown seed was planted in this field (item 9=2) the percent would be 100.

Item 10: Seed Cost

Record the *per-unit cost* of purchased seed planted in the selected field. If both purchased and homegrown seed was used on this field, record the cost per unit for the portion that was purchased only.

Include landlord share.

Include costs for seed treatments and any technology fees charged by the seed company.

Record the cost in dollars and cents per unit and enter the code for the appropriate unit.

Item 11: Seeding Rate

Determine the initial (first) seeding rate per acre for the selected field. Do NOT include any replanting or over seeding (full or partial) as part of this rate. Enter the RATE of seeding and also the UNIT for the seeding rate. Record the units to the nearest TENTH (1/10). For example, if the operator responds in pounds per acre, be sure to record the tenths of pounds.

Valid codes for the seeding rate units are:

1 = **Pounds/Acre**
2 = **Cwt/Acre** (hundredweight, 100 pounds)
3 = **Tons/Acre**
4 = **Bushels/Acre**
23 = **50 Lb. Bags/Acre**

For example, a seeding rate of 1 bushel for each 2 acres of wheat (i.e. one-half bushel per acre) would be recorded as 0.5 units with 4 as the unit code.

Item 12: Acres Replanted

Record the total number of acres of the selected field that were replanted to the target commodity. Enter acres to the nearest TENTH of an acre.

If some acres were replanted more than once, count them again: number of acres replanted times number of times replanted. Example: In a 30 acre field, if 10 acres were replanted three times and 10 acres were replanted once, the total acres replanted would be 40.0 acres.

Item 13: Resistant Seed Type

Item 13a & 13b: Resistant Seed Type 2017 or 2016

Herbicide resistant seed varieties (non-genetically modified) are available to wheat growers. Ask the respondent if any herbicide resistant seed (such as, Clearfield.) was planted in the selected wheat field. Enter code "1" for YES.

Item 14: Seed Treatment Code

The purpose of this question is to identify if the planted seed was treated with a fungicide or insecticide. If treated enter a "1" and continue to 14a to report which seed treatment product was used in the selected field. Enter the product code from the Respondent Booklet of the seed treatment used. If a seed treatment used is not listed in the Respondent Booklet, enter code 999.

Item 15: Field Harvested

The purpose of this question is to determine if the selected field has been harvested. Determine if harvest of the selected field has been completed at the time of the interview. If harvest has not been completed, use alternative wording in parentheses in the next few questions about what the operator expects to be the result of harvest.

Item 16: Acres Harvested and Yield

This item obtains the disposition of the target commodity acres planted in the selected field and actual or expected yield.

If the selected field has been harvested, record the average yield per acre for the purpose indicated. Record the yield per acre to the nearest tenth of a unit in column 1 and the unit code in column 2.

If harvest of the selected field is not complete, use the alternative wording in parentheses and ask the operator what yield per acre is expected at harvest.

Acres Harvested for Grain

Determine acres in the selected field harvested for grain. If harvest of the field has not been completed at the time of the interview, use the alternative

wording in parentheses and ask how many acres **will be** harvested for the target commodity crop. Record acres to the nearest TENTH of an acre.

Yield per Acre and Unit Code

If the selected field has been harvested, record the average yield per acre for the purpose indicated. Record the yield per acre to the nearest tenth of a unit in column 1 and the unit code in column 2.

If harvest of the selected field is not complete, use the alternative wording in parentheses and ask the operator what yield per acre is expected at harvest.

Acres Harvested for Hay, Silage, or Green Chop

Determine acres in the selected field harvested for hay, silage, or green chop. If harvest of the field has not been completed at the time of the interview, use the alternative wording in parentheses and ask how many acres **will be** harvested for the target commodity crop. Record acres to the nearest TENTH of an acre.

Yield per Acre and Unit Code

If the selected field has been harvested for hay, silage, or green chop, record the average yield per acre to the nearest tenth of a **ton** per acre.

If harvest of the selected field is not complete, use the alternative wording in parentheses and ask the operator what yield per acre is expected at harvest.

Acres for Commercial Seed Contract

Determine acres in the selected field grown for commercial seed under contract. Record acres to the nearest TENTH of an acre.

Yield per Acre and Unit Code

If the selected field has been harvested, record the average yield per acre for the purpose indicated. Record the yield per acre to the nearest tenth of a unit in column 1 and the unit code in column 2.

If harvest of the selected field is not complete, use the alternative wording in parentheses and ask the operator what yield per acre is expected at harvest.

Acres Abandoned

Determine acres in the selected field that were abandoned before harvest. Record abandoned acres to the nearest tenth of an acre. Indicate with a note why the acres were abandoned. Abandoned acres are different than acres for other purposes. Include as acres abandoned only acres that were planted with the intention of harvest, but were not harvested for any reason.

Do not count acres for other uses as acres abandoned and vice versa. Acres abandoned are those that were planted with the intention of harvest, but then abandoned prior to harvest for any number of reasons. Acres used for other purposes must be explained in a note!

Acres Used for Some Other Purpose

Determine acres in the selected field that were used for some purpose other than those covered in Items 16a, 16b, 16c, or 16d. This includes acreage used for a cover crop. Record these acres to the nearest tenth of an acre.

Acres planted for cover crop or for a purpose other than those covered in 16a, 16b, 16c, or 16d should be recorded in 16e, Acres used for some other purpose.

Acres for other purpose are those acres that were planted and used for some purpose other than those listed in Items 16a, 16b, 16c, or 16d.

Item 17: Straw

If wheat straw was harvested from the selected field, enter code "1" and continue with item 18, otherwise, go to item 19.

Item 18: Straw Acres

Record the number of acres of wheat straw harvested from the selected field in TENTHS of acres.

Tons of Wheat Straw

Determine the total tons of wheat straw harvested from the selected field.

Work area is provided for your use in calculating total tons. If the respondent can provide tons per acre, calculate total tons by multiplying tons per acre times acres recorded in Item 18. If the respondent can provide total bales and bale weight harvested, calculate total tons by multiplying number of bales times pounds per bale divided by 2000.

Landlord Share of Wheat Straw

Record the Landlord's share of the total wheat straw harvested from the selected field, either in terms of percent of the field's harvest or tons.

Cost of Baler Twine/Wire

Record total cost of baler twine/wire used to bale the wheat straw from the selected field in whole dollars.

Price Received for Wheat Straw

If any of the wheat straw harvested from the selected field was sold, record the total dollars and cents received per TON.

Item 19: Type of Livestock Grazed Selected Field

Enter the code that identifies the type of livestock that grazed the selected field before harvest. If livestock did not graze the selected field, enter code '4' and go to item 20.

Head of Livestock Grazed Selected Field

If livestock grazed the selected field, enter the number of head regardless of livestock ownership.

Number of Days Livestock Grazed

If livestock grazed the selected field, enter the total number of days grazed regardless of livestock ownership.

Grazed-Out Field

If the field was "grazed-out" instead of harvested enter '1' and continue.

Grazed Owned by Operation

If the field was grazed by livestock owned by the operation enter '1' and

continue.

Amount Received from Others for Livestock Grazing

If livestock grazed the selected field but were not owned by the operator, record the amount received from others for allowing the livestock to graze this field.

Item 20: Crops Planted in Previous Years

This item obtains the crop planted in the selected field for the previous 4 crop years. Information about previous crops grown, along with tillage practices, allow researchers to assess the residue of previously-harvested crops and determine common crop rotation patterns.

In the series of Items a-h, you will ask the operator to identify the crops that were previously **planted** on the selected field during the time periods working backwards to 2013.

Include cover crops planted during the indicated period.

The action of planting the crop must have occurred during the time period named in each individual item.

If a crop was growing on the field during a particular time period, but it was not planted during that period, then code 318 (no crop planted during time period) should be entered in the appropriate cell. Perennial crops, such as alfalfa, clover, or other grasses, should only be captured in the time period during which they were actually seeded. The **one exception** to this rule is Item 20h (SPRING/SUMMER of 2013). If a perennial crop was growing on the field at that time, it should be recorded, even if it was not planted at that time. Completing this question has presented some difficulties, especially when double cropping occurs. To address these problems, we have defined the planting periods as Spring/Summer and Fall.

The reason for including summer in the spring planting period is that in some States when double cropping occurs, the second crop may not be planted until late June or early July. Thus, the spring/summer period really extends up to the fall planting period. The fall period would be for planting winter crops, such as winter wheat or cover crops.

General Instructions for Completing

Enter the crop code for the crop previously planted on the selected field for **each** of the designated time periods. Use the Partial Crop Code List printed in the questionnaire. For any crops not listed in the Partial Crop Code List, write the crop name in the space provided, and leave the code box for the crop code blank. The survey statistician in the Office will fill in the correct crop code for that crop.

Use code 321 if a perennial was growing but not planted on the field at this time. Use code 320 if the field was fallowed but cultivated. If the field was not planted to a crop, and codes 320 or 321 do not apply, use code 318 (no crop planted).

If the operator did not operate the field in any of the previous time periods and doesn't know what crops were planted, note this in the margin.

Record crops if they were **planted** during the time period, even if the crop was abandoned before harvest because of drought, hail, or some other event.

If the current field was subdivided into two or more fields in a previous period, record the crop that occupied the largest portion of the current field. For example, if the current field is 100 acres and last year 60 acres were fallow and 40 acres were wheat, record fallow (Code = 318) as the previous crop.

Crop Planted Fall 2016

Record the code for the crop **planted** on the selected field in the fall of 2016. If a crop was planted, it would likely be a cover crop or a winter crop. For winter wheat planted during the fall of 2016 for the 2017 harvest, enter crop code 165 and continue with item 20b.

Crop Planted Spring/Summer 2016

Record the code for the crop **planted** on the selected field in the spring/summer of 2016.

Crop Planted Fall 2015

Record the code for the crop **planted** on the selected field in the fall of 2015. If a crop was planted, it would likely be a cover crop or a winter crop.

Crop Planted Spring/Summer 2015

Record the code for the crop **planted** on the selected field in the spring/summer of 2015.

Crop Planted Fall 2014

Record the code for the crop **planted** on the selected field in the fall of 2014. If a crop was planted, it would likely be a cover crop or a winter crop.

Crop Planted Spring/Summer 2014

Record the code for the crop **planted** on the selected field in the spring/summer of 2014.

Crop Planted Fall 2013

Record the code for the crop **planted** on the selected field in the fall of 2013. If a crop was planted, it would likely be a cover crop or a winter crop.

Crop Planted Spring/Summer 2013

Record the code for the crop **planted** on the selected field in the spring/summer of 2013.

If a perennial crop, such as alfalfa, clover, or other grasses, was growing on the selected field in the spring/summer of 2013, enter the code for the perennial crop, even if it was not planted during this period.

Examples of Completing Crop Codes

The examples demonstrate how to complete Item 20.

Example 1: Crop Rotation: Continuous Crop

Items 20a, 20c, 20e, and 20g are coded with '165'for winter wheat.

Items 20b, 20d, 20f, and 20h are coded with 318, even though this is only a normal time period between continuous crops. No crop was PLANTED on the selected field during these fall periods.

Previously planted crops, continuous crop winter wheat.

What crop was PLANTED on this field in --		
	CROP NAME	CROP CODE
a. **FALL of 2016**?.	**Winter Wheat**	**165**
b. **SPRING/SUMMER of 2016**?.	**None**	**318**
c. **FALL of 2015**?.	**Winter Wheat**	**165**
d. **SPRING/SUMMER of 2015**?.	**None**	**318**
e. **FALL of 2014**?.	**Winter Wheat**	**165**
f. **SPRING/SUMMER of 2014**?.	**None**	**318**
g. **FALL of 2013**?.	**Winter Wheat**	**165**
h. **SPRING/SUMMER of 2013**?.	**None**	**318**

Example 2: Crop Rotation: Perennial (hay) Crop

Alfalfa crop planted prior to the spring 2013. Target crop planted in spring of 2017.
Previously planted crops, perennial crop example.

What crop was PLANTED on this field in --		
	CROP NAME	CROP CODE
a. **FALL of 2016**?.	**Alfalfa Growing**	**318**
b. **SPRING/SUMMER of 2016**?.	**Alfalfa Growing**	**318**
c. **FALL of 2015**?.	**Alfalfa Growing**	**318**
d. **SPRING/SUMMER of 2015**?.	**Alfalfa Growing**	**318**
e. **FALL of 2014**?.	**Alfalfa Growing**	**318**
f. **SPRING/SUMMER of 2014**?.	**Alfalfa Growing**	**318**
g. **FALL of 2013**?.	**Alfalfa Growing**	**318**
h. **SPRING/SUMMER of 2013**?.	**Alfalfa hay**	**1**

Seed Cost Cover Crop Used

If the operator planted a cover crop in Spring/Summer or Fall of 2016 on this field, continue with item 20(i), otherwise, go to item 21.

If a cover crop was planted, **Item 20**, the operator should be asked what dollars and cents per acre was paid for the cover crop seed.

Item 21: Resource Concerns

Resource concerns are problems or potential problems that could be addressed through a change in production practices or application of one or more conservation practices. For each resource concern listed in the left-hand column, the respondent should indicate whether this resource concern is present on this field and whether technical assistance in addressing this resource concern has been received from one or more of the listed sources.

If respondent reports yes for any of the resource concerns, enter 1 in the code box and select the technical assistance from any of the following sources (1-4) that was used to evaluate the resource concern. Report up to 3 sources of technical assistance for each resource concern.

Item 22: Land-Use Practices

Analysts are interested in the adoption of conservation practices and other long-term capital improvements on cropland. To obtain the required information, you will ask when certain practices were established. Determine whether the land use practices in Items a-h were used on the selected field for the target commodity. Include land not devoted to the target commodity if the operator considers it to be part of the selected field.

Each of the individual items, ***a*** *through* ***h,*** must be asked. The operator may use more than one of the land use practices listed. Enter code "1" = YES for each practice the operator used in column 2.

Respondents should enter the year the practice listed in column 1 was first used on the field in column 3. If the practice was already in place when the respondent first started farming the selected field (for example, terraces or a grass waterway was already on the field) write down the first year the producer farmed the selected field.

Column 4 is seeking information on technical and financial assistance from

USDA and other conservation programs for the practices listed in column 1. USDA and other agencies support conservation through technical assistance (e.g., terrace design or layout) and financial assistance for the adoption of conservation practices. For practices where the respondent entered 1 in column 2, was technical or financial assistance received at any time?

For example, if terraces are in place on the field, did the producer ever receive technical or financial assistance for the installation of the terraces?

A second example: if conservation tillage is in use, did the producer receive technical or financial assistance with the initial adoption of conservation tillage in this field? Conservation technical and financial assistance is usually received once (for conservation structures) or for a period of up to 3 years (conservation management practices) when a practice is initially adopted. Conservation payments may have been received in prior years. Both types of assistance could be received for the same practice.

Farmers may have adopted practices required by regulation or other policies. On highly erodible land, for example, producers must apply approved soil conservation systems to meet the requirements of USDA conservation compliance. Farmers who have large livestock operations may also be subject to federal or state regulation of waste management. These regulations typically require farmers to develop and apply nutrient management plans.

Conservation tillage and No till

Conservation tillage is a method which aims to plow the soil in a manner which reduces erosion potential, conserves energy, and improve organic matter. **No till** is a conservation practice that grows crops from year to year without disturbing the soil through tillage.

Determine if conservation tillage or no till was used on the field in 2017. If "Yes", enter a code "1" in column 2. Enter the first year it was used on this field in column 3. If the farm has ever received technical or planning assistance on this field for this practice (or plan), enter the code ("1", "2" or "3") corresponding to the source of assistance in column 4 or enter the code "4" in column 4 if no technical assistance was received. If the farm has ever received financial assistance (formerly known as cost share) on this field for this practice (or plan), enter the code ("1", "2", "3", or "4") corresponding to the source of assistance in column 4 or enter the code

"5" in column 4 if no financial assistance was received. Enter code for whether practice or plan satisfied a requirement in column 5.

Cover Crops

Include grasses, legumes, forbs, or other herbaceous plants for seasonal cover and conservation. Determine if a cover crop was used on the field in 2017. If "Yes", enter a code "1" in column 2. Enter the first year it was used on this field in column 3. If the farm has ever received technical or planning assistance on this field for this practice (or plan), enter the code ("1", "2" or "3") corresponding to the source of assistance in column 4 or enter the code "4" in column 4 if no technical assistance was received. If the farm has ever received financial assistance (formerly known as cost share) on this field for this practice (or plan), enter the code ("1", "2", "3", or "4") corresponding to the source of assistance in column 4 or enter the code "5" in column 4 if no financial assistance was received. Enter code for whether practice or plan satisfied a requirement in column 5.

Structural Practices

Include grass water ways, terraces, grade stabilization, contour buffer strips, etc. Determine if structural practices were used on the field in 2017. If "Yes", enter a code "1" in column 2. Enter the first year it was used on this field in column 3. If the farm has ever received technical or planning assistance on this field for this practice (or plan), enter the code ("1", "2" or "3") corresponding to the source of assistance in column 4 or enter the code "4" in column 4 if no technical assistance was received. If the farm has ever received financial assistance (formerly known as cost share) on this field for this practice (or plan), enter the code ("1", "2", "3", or "4") corresponding to the source of assistance in column 4 or enter the code "5" in column 4 if no financial assistance was received. Enter code for whether practice or plan satisfied a requirement in column 5.

Nitrogen Application Practices

Include splitting nitrogen applications 50% after crop emergence, applying nutrients 30 days prior to planting, precision application of nutrients, or using controlled released fertilizer. Determine if nitrogen application practices was used on the field in 2017. If "Yes", enter a code "1" in column 2. Enter the first year it was used on this field in

column 3. If the farm has ever received technical or planning assistance on this field for this practice (or plan), enter the code ("1", "2" or "3") corresponding to the source of assistance in column 4 or enter the code "4" in column 4 if no technical assistance was received. If the farm has ever received financial assistance (formerly known as cost share) on this field for this practice (or plan), enter the code ("1", "2", "3", or "4") corresponding to the source of assistance in column 4 or enter the code "5" in column 4 if no financial assistance was received. Enter code for whether practice or plan satisfied a requirement in column 5.

Reduce Soil Erosion

Determine if a conservation plan specifying practices to reduce soil erosion was used on the field in 2017. If "Yes", enter a code "1" in column 2. Enter the first year it was used on this field in column 3. If the farm has ever received technical or planning assistance on this field for this practice (or plan), enter the code ("1", "2" or "3") corresponding to the source of assistance in column 4 or enter the code "4" in column 4 if no technical assistance was received. If the farm has ever received financial assistance (formerly known as cost share) on this field for this practice (or plan), enter the code ("1", "2", "3", or "4") corresponding to the source of assistance in column 4 or enter the code "5" in column 4 if no financial assistance was received. Enter code for whether practice or plan satisfied a requirement in column 5.

Nutrient Management Plan

Determine if a nutrient management plan specifying practices for fertilizer or manure applications was used on the field in 2017. If "Yes", enter a code "1" in column 2. Enter the first year it was used on this field in column 3. If the farm has ever received technical or planning assistance on this field for this practice (or plan), enter the code ("1", "2" or "3") corresponding to the source of assistance in column 4 or enter the code "4" in column 4 if no technical assistance was received. If the farm has ever received financial assistance (formerly known as cost share) on this field for this practice (or plan), enter the code ("1", "2", "3", or "4") corresponding to the source of assistance in column 4 or enter the code "5" in column 4 if no financial assistance was received. Enter code for whether practice or plan satisfied a requirement in column 5.

Pest Management

Determine if a pest management plan to implement Integrated Pest Management (IPM) to control weeds, insects, or disease was used on the field in 2017. If "Yes", enter a code "1" in column 2. Enter the first year it was used on this field in column 3. If the farm has ever received technical or planning assistance on this field for this practice (or plan), enter the code ("1", "2" or "3") corresponding to the source of assistance in column 4 or enter the code "4" in column 4 if no technical assistance was received. If the farm has ever received financial assistance (formerly known as cost share) on this field for this practice (or plan), enter the code ("1", "2", "3", or "4") corresponding to the source of assistance in column 4 or enter the code "5" in column 4 if no financial assistance was received. Enter code for whether practice or plan satisfied a requirement in column 5.

Water Management

Determine if an irrigation water management plan specifying irrigation practices was used on the field in 2017. If "Yes", enter a code "1" in column 2. Enter the first year it was used on this field in column 3. If the farm has ever received technical or planning assistance on this field for this practice (or plan), enter the code ("1", "2" or "3") corresponding to the source of assistance in column 4 or enter the code "4" in column 4 if no technical assistance was received. If the farm has ever received financial assistance (formerly known as cost share) on this field for this practice (or plan), enter the code ("1", "2", "3", or "4") corresponding to the source of assistance in column 4 or enter the code "5" in column 4 if no financial assistance was received. Enter code for whether practice or plan satisfied a requirement in column 5.

Item 23: Conservation Program Participation

Enter code "1" if either the operator or the landlord received (or expected to receive) cost-sharing, incentive payments, stewardship payments or rental payments based on a current conservation program contract for conservation practices or systems that are currently in use or will be applied in the selected field. Do not include commodity or disaster payments. Be sure to consider grassed waterways, filter strips, and other "buffer" practices on or adjoining the selected field. Note that CRP rental payments could be made on land

devoted to these practices through CREP or continuous signup for high-priority practices.

Respondents should enter 1 if the field was included in a conservation program contract that was active in 2017, under the conservation program listed in the left-hand column.

Cost Sharing Payments for Conservation Program Participation

Environmental Quality Incentives Program (EQIP) Enrollment

Enter code "1" if the operator participated in the EQIP. The selected field would also be considered enrolled in EQIP if it was part of a comprehensive nutrient management plan for applying fertilizer or manure under EQIP.

Conservation Security Program (CSP) Enrollment

There is an increased need by policymakers to determine the relationship between the adoption of conservation practices/structures and participation in conservation programs. Enter code "1"if the operator participated in the CSP.

Conservation Reserve Program (CRP)

FSA provides cost share assistance to participants who establish approved cover on eligible cropland. The cost-share assistance can be an amount not more than 50 percent of the participants' costs in establishing approved practices. Enter code "1"if the operator participated in the CRP.

Other Federal, State, Local or Non-government Source

List the program and enter code "1"if the operator participated in a conservation program other than EQIP, CSP, or CRP.

Item 24: Conservation Funding

Determine if the respondent applied for conservation funding for the selected field in the last four years. If conservation funding was applied for within the last four years, enter 1 for item 24.

Item 25: Reasons for not applying for Conservation Program

Analysts are interested in why some producers apply for participation in conservation programs while others do not. For producers who did not apply for a conservation program during the past four years ask about a series of reasons for not applying. For each statement ask the producer whether it was not a reason, a minor reason, or a major reason for not applying for conservation program funding. If the producer does not know, check box 1. Enter the box number code corresponding to the chosen answer in the last column.

I was not aware of USDA or other conservation programs

Enter the appropriate code.

I am not aware of environmental problems (on this field)

Environmental problems could include soil erosion, nutrient runoff, loss of wildlife habitat, and others. In answering this question, producers should consider only those environmental problems that have not been addressed. Producers who have fully addressed all previously identified environmental problems should agree with this statement. **Enter** the appropriate code.

Payments are not high enough

Payments may cover only a part of a producer's actual cost of installing or adopting conservation practices. For structural practices (e.g., terraces, grassed waterways), conservation programs typically cover only a share of actual costs. For management practices (conservation tillage, for example) actual costs are difficult to determine. Conservation programs can provide incentive payments for adoption but these payments may not cover the full cost of transitioning to new practices. Because adoption costs can vary across farms, some farms may believe the payment is high enough while others do not. **Enter** the appropriate code.

Government standards make practices more expensive than they need to be to get the job done

Structural practices (e.g., terraces) installed with assistance from USDA conservation programs must meet minimum standards

developed by the Natural Resources Conservation Service (NRCS). In some circumstances, farmers may believe that meeting these standards unnecessarily increases the cost of practices. **Enter** the appropriate code.

My offer would not have been accepted because the problems in this field are not national or state priorities

For a number of USDA conservation programs, priorities are developed largely on a state-by-state basis within guidelines set at the national level. Some practices may be eligible for payments because of national environmental or resource conservation concerns, while other concerns vary across states (and within states) based on the climate, topography, and the type of agricultural production. **Enter** the appropriate code.

The application process is too complicated and time – consuming

Applying for a USDA conservation program can require considerable time and effort. Applications must be specific about which resource concerns will be addressed (e.g., soil erosion, nutrient runoff), what practices will be employed in addressing these concerns, and the fields on which the practices will be used. **Enter** the appropriate code.

Too Difficult to Obtain Technical Assistance to Prepare Application

Many conservation practices require producers to keep detailed records. For example, producers who receive payments for nutrient management may be required to keep detailed records on all fertilizer and manure applications, including the date of application, type of fertilizer or manure used, and method of application. **Enter** the appropriate code.

Item 26: Conservation Funding

In many conservation programs, budget limits mean that not all applicants can be enrolled. Respondents should enter 1 if they have applied to a conservation program during the past 4 years but have not been enrolled.

Item 27: NRCS Classification of Highly Erodible Land

The Natural Resource Conservation Service (NRCS) would have evaluated the selected field and notified the operator of its classification if the operator had requested any kind of federal program benefits for the selected field.

Whether a field is classified as Highly Erodible depends on rainfall, the potential for soil erosion, and the length and slope of the field. NRCS uses these characteristics and other information to classify fields as Highly Erodible or not.

Enter code "1" if the NRCS has notified the operator that the selected field has been classified as "Highly Erodible" or HEL land.

Item 28: Wetland Designation

Wetlands are areas where the normal condition of the soil is to be wet enough for long enough to support the continued growth of the kinds of plants that prefer wet soil conditions.

Enter code "1" if the NRCS has notified the operator that the selected field has been designated a wetland or contains a wetland.

Item 29: Field Slope

The need for conservation practices to control soil erosion and nutrient runoff often depend on amount of slope present in the field. Respondents should choose the slope category that best describes the field.

Item 30: Soil Type

Soil texture is also a factor affecting soil erosion, irrigation management, nutrient management, and other conservation-related activities. Respondents should choose the texture category that best describes the field.

Item 31: Subsurface Drainage

Respondents should mark 1 if there is a subsurface drainage system (e.g., tile drainage) in use on the field.

Subsurface Drainage

Respondents should provide the year in which the system was installed, if known.

Subsurface Drainage Depth

Respondents should provide information on the average depth of the drainage system. This would be how deep the tile or other pipe drainage system was buried in the ground. Record the average depth in inches. (e.g. 3 feet = 36 inches)

Tiles Diameter

Respondents should report the diameter of the system tiles

Hours to Return to Normal Soil Moistures

Respondents should report how many hours it takes for the field to return to normal soil moisture levels following a heavy storm.

Mechanism for Controlled Drainage

Respondents should mark 1 if there is a mechanism used to control drainage on the field.

Item 32: Hail Crop Insurance

If the selected field is covered by a crop hail insurance policy in 2017, enter "1" and continue.

Coverage per Acre

Collect the dollar amount per acre for hail insurance policy coverage on this field.

Percent Deductible

Collect the percent deductible for the hail insurance policy covering this field.

Premium Cost per Acre

Collect the premium cost per acre paid for the hail insurance policy covering this field.

Item 33: Federal Crop Insurance

This information will be used (1) to characterize the types of farmers who use Federal Crop Insurance and (2) to analyze the relationships between different risk management and cropping practices. For example, one question that will be addressed using this data is whether farmers who purchase crop or revenue insurance use different production practices from farmers who do not purchase insurance.

If the selected field is covered by Federal Crop Insurance in 2017, enter "1" and continue.

The questions in this item relate to the types of insurance the operation purchased in 2017 for this field. If the operator did not have Federal Crop Insurance on the selected field, follow the skip instructions on the questionnaire.

Types of Federal Coverage

The Federal Crop Insurance (FCI) program is overseen by USDA Risk Management Agency but administered by private insurance companies. Since farmers buy these policies from private companies and not through a government office, the farmers may be unsure if their specific crop insurance policy is part of the FCI program. FCI insurance policies are all multi-peril policies – meaning that they insure damage from multiple sources of losses – as opposed to a single-peril policy like crop hail or flood insurance. Farmers may refer to these policies as multi-peril insurance, CAT insurance (for catastrophic coverage only), buy-up insurance (for coverage of more than catastrophic losses), or by the specific name of the policy (yield protection, revenue protection, area yield protection, etc). Farmers can have at most one FCI insurance policy per field. Hint: Have the respondent select the correct type of Federal crop insurance from the

respondent booklet and enter the appropriate code.

Percent of Yield level and Price Level

If the policy purchased in item 33a was a yield based policy (either 33a=2 or 33a=3), enter the yield coverage level insured under that policy and the price coverage level insured under that policy.

Percent of Revenue Coverage

If the policy purchased in item 33a was a revenue based policy (either 33a = 4 or 33a = 5), enter the revenue coverage level insured under that policy.

Section C – Nutrient or Fertilizer Applications

Section C Purpose

The purpose of this section is to identify nutrients or fertilizers used to produce the 2017 target commodity crops on the selected field.

USDA is responsible for publishing estimates of the amount of nutrient or fertilizer used in crop production. Accurate data on nutrient or fertilizer application rates are needed for conducting sound economic analyses to address many complex issues concerning water quality. These analyses enable policy makers to make informed decisions.

Specifically, nutrient or fertilizer application data are used to analyze water quality and agricultural productivity issues and policies. Nutrient or fertilizer data enable a determination of the geographic extent and intensity of use.

Nutrient management practices help farmers adjust fertilizer application to crop needs, and reduce losses to the environment. Legume production, storage and use of livestock and poultry manure, soil, plant, and tissue testing are all methods for computing nutrient balances that establish the basis of sound nutrient management.

ERS uses cost data to estimate fertilizer, soil conditioner, and micronutrient expenses for production of the target commodity.

Use of Supplements

You will use a NUTRIENT OR FERTILIZER SUPPLEMENT if more lines are needed to record fertilizer applications than the number of lines available in the table.

Copy the identification as it appears on the questionnaire to the identification box on the supplement. Assign the next Table number (002, 003, 004, etc.) to each additional supplement used. You begin numbering the supplements with Table 002 because Table 001 appears in the questionnaire. Use as many supplements as you need.

Item 1: Screening for Nutrient or Fertilizer Applications

Determine if COMMERCIAL nutrients or fertilizers (nitrogen, phosphate, potash, and/or sulfur) were applied to the selected field.

If any commercial nutrients or fertilizers were applied, enter code "1" for YES.

Include:

- all chemical nutrient or fertilizer materials applied specifically for the 2017 crop,
- nutrient or fertilizer applied in the fall of 2016 if no crop was grown,
- nutrient or fertilizers applied during the summer of 2016 or earlier years if the selected field was fallow in 2016,
- nutrient or fertilizers applied by custom applicators,
- nitrogen products applied with herbicides to make the herbicide more effective,
- rock phosphate,
- mixed organic nutrient or fertilizer blends,
- commercially prepared manure or compost products.

Exclude:

- micro-nutrients, such as iron, zinc, and boron,
- lime and gypsum/landplaster,
- non-purchased manure and manure produced and used on the operation (unprocessed), on-farm produced composts,
- nutrients or fertilizers applied to previous crops planted in this field (even if the carryover was beneficial to the crop currently in the field).

If commercial nutrients or fertilizers were applied to the field for the 2017 crop, continue. If no commercial nutrients or fertilizers were applied to the selected field, skip to Item 4.

Item 2: Number of Commercial Nutrient or Fertilizer Applications

The number (and timing) of nutrient or fertilizer applications is one of the key indicators of an operator's attempt to manage nutrients. Split applications are

typically recommended as one way to enhance yields while reducing environmental risks.

There has been some anecdotal evidence that the number of acres treated with nutrients or fertilizers may be under-estimated, when acres are treated with multiple applications. This stems from the fact that operators may readily know the total nutrients applied per acre per year but are not able to quickly calculate the amount applied during each application. Hence, we only get one line of data even though one or more applications were made.

Ask the operator how many applications of commercial nutrient or fertilizer were made to the selected field. Include aerial applications. The application can be made to all or part of the field.

Item 3: Nutrient or Fertilizer Applications Table

Column 2: Materials Used

Record the plant nutrients (nitrogen (N), phosphate (P_2O_5), potash (K_2O), and sulfur (S)) of each fertilizer material applied to the selected target commodity field. The nutrients can be reported in either of two ways:

1. **Percent analysis:** This is the percentage composition of the product expressed in terms that the law requires and permits.

> **Percent analysis is the preferred method of obtaining the data.** Use actual plant nutrients only if absolutely necessary. Percent analysis is preferred because products used can be more easily identified this way.

2. **Pounds of actual plant nutrients.** Use pounds of actual plant nutrients if absolutely necessary.

Record the fertilizer data in terms of pounds, gallons, or pounds of actual plant nutrients applied PER ACRE. Be careful that the respondent does not give you the total amount of fertilizer applied to the entire field. If a respondent knows only the total pounds of fertilizer or plant nutrients applied to the field, you must calculate rate per acre and enter it in the table. Rate per acre is calculated as the total quantity applied divided by the acres to which the application was made. Show the computations for deriving the rate per acre in the margin of the form.

For some crops, farmers may say that fertilizer applied to the previous crop grown on the field was partly for the benefit of the selected field. Only part of this fertilizer was actually carry-over for the target commodity. Watch out for this because we DO NOT want to include these fertilizer applications in the fertilizer table.

Important: Record each individual fertilizer application made to the selected field on a separate line.

When fertilizer materials are bulk blended for application (for example, 10-10-10-3 combined with 21-0-0-24), record each product on a separate line in the fertilizer table, even though the fertilizer blend was applied in one trip over the field.

Percent Analysis

The most common method for reporting fertilizer materials is by percent analysis of their content of Nitrogen (N), Phosphate (P_2O_5), Potash (K_2O), and Sulfur (S) in that order, though in many cases Sulfur may be left off. For example, 13-13-13-5 is 13% Nitrogen, 13% Phosphate, 13% Potash, and 5% Sulfur. This means that forty-four (13+13+13+5) out of every one hundred pounds of this fertilizer is active ingredients (N, P_2O_5, K_2O, S). Fifty-six (100 - 44) pounds of every one hundred pounds of this nutrient or fertilizer is carrier material (inert ingredients).

Two of the more common fertilizers used in crop production are 18-46-0 (Di-ammonium phosphate or DAP) and 82-0-0 (anhydrous ammonia). If 18-46-0 were reported, you'd record 18 in Column 2 under N (nitrogen) and 46 under P_2O_5 (phosphate). The K_2O (potash) and S (sulfur) columns would be dashed since there is no potassium (potash) or sulfur in the mixture. For anhydrous ammonia, you'd record 82 under N. Since there is no phosphorus, potash, or sulfur in anhydrous, the phosphate, potash, and sulfur columns should be dashed.

Some nutrient or fertilizer materials are applied in liquid form. A common liquid nutrient or fertilizer material used in crop production is 32-0-0 (nitrogen solution). For this material, you would record a 32 under N for nitrogen and dash the columns for phosphate, potash, and sulfur.

Carrier or filler material makes up the rest of the total weight for commercial nutrients or fertilizers. If a farmer reports 35-45-20, he's probably reporting pounds of actual nutrients instead of analysis since the three amounts (35 + 45 + 20) add up to more than 85 percent. **However, if sulfur is incorporated into the material, this rule no longer holds true when all four analysis are added together.**

For fertilizer applications reported by percent analysis, record the quantity applied per acre (including carrier) in Column 3 and the appropriate unit of measure, pounds (code 1) or gallons (code 12), in Column 4.

For bulk blended fertilizer materials, use a separate line for each of the fertilizers that the dealer blended in the mixture. If the dealer mixed 150 pounds of 18-46-0-0 and 250 pounds of 0-0-21-23 together, record each on a separate line. DO NOT just add it up and record it on one line as 400 pounds of 18-46-21-23.

This would be a major error, because the correct analysis of this fertilizer is 7-17-13-14, calculated by:

N (150 ÷ 400) x .18 = .068 (or 7%)

because there were 150 pounds of 18-46-0-0 in the mixture and of those 150 pounds, 18% was Nitrogen.

P_2O_5 (150 ÷ 400) x .46 = .173 (or 17%)

because 46 percent of the 150 pounds was available Phosphorus.

K_2O (250 ÷ 400) x .21 = .131 (or 13%)

because there were 250 pounds of 0-0-21-23 in the mixture and of those 250 pounds 21% was Potash.

S (250 ÷ 400) x .23 = .143 (or 14%)

because 23 percent of the 250 pounds was available Sulfur.

Actual Plant Nutrients

Another way farmers might report fertilizer use is in terms of Actual Plant Nutrients (AN) applied per acre. This may also be called pounds of active ingredients. If the farmer knew he applied 60 pounds of nitrogen; 35 pounds of phosphorus; 40 pounds of potash; and 35 pounds of sulfur PER ACRE, record this information in Column 2 and record code 19 in Column 4. In this case, Column 3 should be 'blank' because we know the actual amount applied for each of the three materials so we don't need to calculate it from percentages.

When farmers report "units" of N, P_2O_5, K_2O, or S this is usually a clue that they are reporting pounds of actual nutrients. Fertilizer materials will amount to more than the actual nutrient contents of the products applied, because part of the material applied is carrier material, just like when the farmer reports by percent analysis.

For example, if the farmer reported that he applied 100 units of Nitrogen in the form of anhydrous ammonia, he would have applied about 122 pounds of 82% nitrogen (100 ÷ .82 = 122). If this were reported by percent analysis, 82 would be recorded in the N column, 122 in Column 3 and 1 in Column 4. If it were reported as pounds of actual nutrients it would be recorded as 100 in the N column and 19 in Column 4. Column 3 would be left blank.

When actual plant nutrients (active ingredients) or "units" of a fertilizer are reported, you should probe to be sure the quantity applied is correct. One way to do this is to ask (when units were reported) if the actual weight of material applied was more than the number of units reported.

For example, "You said you put down 100 units of UAN32 per acre. Did the material you applied actually weigh more than 100 pounds per acre?"

Other Methods of Reporting Fertilizer Use

Farmers may also report fertilizers by name. The Respondent Booklet shows some of the more common fertilizers with their usual analysis.

Anhydrous ammonia is the strongest nitrogen fertilizer available. It must be stored in a tank under pressure. It is applied by injection into the ground or into irrigation water. Anhydrous is a liquid when under pressure, but turns into a gas when released and is lost if not injected into the soil. Anhydrous ammonia is a very popular fertilizer because it is often cheaper (per pound of nutrient) than other forms. It may be reported as "anhydrous", "gas", "NH3", "82-0-0", "units of nitrogen", or as "pounds of actual nitrogen" (N).

Aqua ammonia is one of the more common types of liquid nitrogen fertilizers. It is made up of anhydrous ammonia and water and is often used in Western states. It may be reported in pounds (actual N) or gallons (material or product). Although it is a liquid, it is usually reported in pounds of actual N.

Urea is another commonly used nitrogen fertilizer because it has a high nitrogen analysis. It may be added through an irrigation system, usually as a nitrogen solution.

Calcium nitrate contains not less than 15 percent nitrogen and 19 percent calcium. Limestone or lime contains 40 percent calcium and 12 percent carbonate. Approximately 100 pounds of limestone contains the calcium equivalent of 210 pounds of calcium nitrate (100 * .4 = 40 pounds and 210 * .19 = 40 pounds). For example, if 200 pounds per acre of calcium nitrate were applied to the selected field, "15" would be recorded in column 2 (Nitrogen), "200" in column 3 (quantity) and a "1" in column 4 (pounds). ***Don't forget*** that you must also report the limestone amount in Item 16b. In this example, .475 (19/40) * 200 = 95 so, 95 would be added to the total quantity of lime applied and reported in Item 16b.

With many of the other fertilizers listed in the Respondent Booklet, the analysis may vary. Probe to find out if the farmer knows the analysis or the pounds of actual nutrients applied. If he doesn't know the analysis but knows the name, use the analysis shown in the Respondent Booklet.

Column 3: Quantity Applied per Acre

If percent analysis is reported, record the amount of material applied to the selected field in terms of pounds or gallons applied per acre. If pounds of actual nutrients were reported in Column 2, leave this column blank.

Be careful that the respondent does not give you the total amount of fertilizer applied to the entire field. If a respondent knows only the total pounds of fertilizer or plant nutrients applied to the field and not the rate per acre, you must calculate rate per acre and enter it in the table. In the margin of the form, show the computations for deriving the rate per acre.

Total Pounds ÷ Acres = Rate per Acre

For example, if the farmer applied a total of 1200 pounds to a sixty acre field, the rate per acre is calculated as:

1200 pounds ÷ 60 acres = 20 pounds per acre

Column 4: Material Unit Code

If percent analysis is reported in Column 2, record either pounds of material (code 1) or gallons of material (code 12).

If pounds of actual plant nutrients are reported in Column 2, enter code 19 in Column 4 and leave Column 3 blank.

Column 5: When Applied

Ask the respondent whether the **nutrient or fertilizer application** was made before seeding in the fall, before seeding in the spring, at seeding, or after seeding.

Always record each application on a separate line. Do not combine multiple applications of the same nutrient or fertilizer product on one line.

Column 6: How Applied

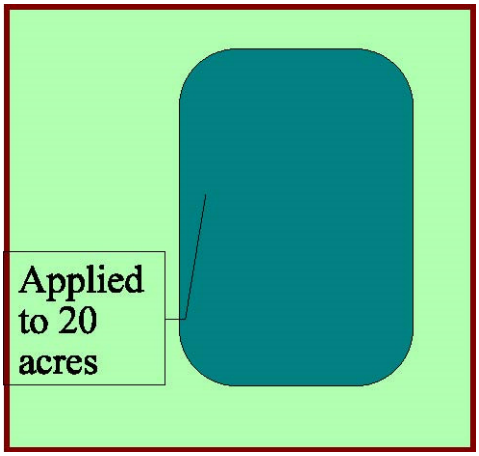
Show the respondent the Nutrient or Fertilizer/Pesticide Applications Method Codes in the Respondent Booklet. Ask the respondent which of the application methods was used to apply the fertilizer to the

selected field.

The Application Method codes are:

Code 1 - **Broadcast, Ground without Incorporation**	Fertilizer material is applied to the entire surface area by land application equipment. Application may occur either before or after planting, usually before crop emergence. No mixing of the fertilizer material into the upper soil surface is needed or planned as part of the application.
Code 2 - **Broadcast, Ground with Incorporation**	Fertilizer material is applied to the entire surface area by land application equipment. Application usually occurs before planting, and a planned mixing of the fertilizer into the upper soil surface is completed at the time or shortly after the time of application. Incorporation of the fertilizer into the upper soil surface is often performed with a field cultivator, disk, or other tillage implement.
Code 3 - **Broadcast by Aircraft**	Fertilizer material is applied to the entire surface area by air application equipment. Include only those applications made by airplane or helicopter.
Code 4 - **In Seed Furrow**	Fertilizer material is placed in the seed furrow at planting time, generally through a separate attachment on the grain drill.
Code 5 - **Irrigation Water**	Fertilizer material is mixed with water in either sprinkler or gravity fed irrigation systems. The term used for this procedure is fertigation. The product is metered into the water delivery system (generally a sprinkler irrigation system) and is distributed across the field in the irrigation water.
Code 6 - **Chisel, Injected or Knifed-in**	Fertilizer material is injected under pressure into the soil. This application method (using high pressure) is often used to apply anhydrous ammonia.
Code 7 - **Banded or Side-dressed in or over Row**	Fertilizer material is placed in or over the crop row. This method is mainly used for row crops. Products are applied **at or after planting**. The area between the rows is not treated.

	Fertilizer products applied at-planting are generally granular formulations and are placed in a 3 to 4 inch band on either side or above the seed. Early growing-season applications are also applied (either liquid or granular) on either side of the crop row.
Code 8 - **Foliar or Directed Sprays**	After planting, fertilizer material is sprayed on or under the plant foliage.



Column 7: Acres Treated

When only a portion of the field is treated it is called a **partial field treatment**. All land areas within the indicated area were not treated with the fertilizer application. For example, if the farmer applied 320 pounds of 18-46-0 to 20 acres in the center of a 40 acre field after the crop emerged, the line of the nutrient or fertilizer table would be completed as follows. Note the amount per acre is calculated as 320 pounds ÷ 20.0 acres treated = 16 pounds per acre.

LINE	2 MATERIALS USED [Enter percentage analysis or actual pounds of plant nutrients applied per acre.] [Show Common Nutrients or Fertilizers in Respondent Booklet.]				3 What quantity was applied per acre? [Leave this column blank if actual nutrients were reported.]	4 [Enter material code.] 1 Pounds 12 Gallons 19 Pounds of actual nutrients	5 When was this applied? 1 In the fall before seeding 2 In the spring before seeding 3 At seeding 4 After seeding	6 How was this applied? [Refer to code list above.]	7 How many acres were treated in this application? ACRES
	N Nitrogen	P_2O_5 Phosphate	K_2O Potash	S Sulfur					
01	18	46	---	---	16	1	4	7	20.0

Record the number of acres in the selected field that were treated with the nutrient or fertilizer materials recorded in Column 2. If only part of a field was treated, record only those acres. For example, if the operator made a particular application of fertilizer to only 25 acres in a 40 acre field, enter 25.0 in Column 7. Since each individual application of nutrient or fertilizer must be recorded on separate lines, the figure entered in Column 7 can never be greater than the number of acres in the field.

Acres and tenths of acres must be reported in Column 7. Zero must be recorded after the decimal point if whole acres are recorded. For example, if the operator treated exactly 25 acres, the entry in Column 7 must be 25.0. Otherwise the summary will consider the entry to be 2.5 and serious errors will result when we summarize the amount of nutrient applied. Applications done at seeding will normally cover the entire planted acres. However, it is possible for the application to only cover a portion of the field, for different application rates to be used, or for different products to be applied to different areas at planting. When the acres covered by "at seeding" applications does not equal the planted acres, verify this with a note in the margin.

LINE	2 MATERIALS USED [Enter percentage analysis or actual pounds of plant nutrients applied per acre.] [Show Common Nutrients or Fertilizers in Respondent Booklet.]				3 What quantity was applied per acre? [Leave this column blank if actual nutrients were reported.]	4 [Enter material code.] 1 Pounds 12 Gallons 19 Pounds of actual nutrients	5 When was this applied? 1 In the fall before seeding 2 In the spring before seeding 3 At seeding 4 After seeding	6 How was this applied? [Refer to code list above.]	7 How many acres were treated in this application?
	N Nitrogen	P_2O_5 Phosphate	K_2O Potash	S Sulfur					ACRES
01	16	20	----	15	100	1	1	1	50.0
02	82	----	----	----	120	1	1	6	50.0
03	28	----	----	----	125	1	4	1	50.0
04	60	35	40	----	----	19	4	7	50.0

In the above example:

Line 1 shows an application of 100 pounds per acre of ammonium sulfate broadcast without incorporation in the fall, before seeding to 50 acres.

Line 2 shows an application of 120 pounds per acre of anhydrous ammonia injected in the fall, before seeding to 50 acres.

Line 3 shows an application of a 125 pounds per acre of a 28 percent nitrogen solution broadcast without incorporation after seeding to 50 acres.

Line 4 shows an application of 60 pounds of nitrogen, 35 pounds of

phosphate, and 40 pounds of potash per acre, banded/side-dressed after seeding to 50 acres.

Item 4: Nutrient or Fertilizer Custom Costs

If any of the nutrient or fertilizer applications were made by custom applicators enter code "1" for YES and continue with item 4a, otherwise go to item 5.

Item 4a: Custom Application Charge Identifiable

First, ask the respondent if he is able to report the cost of custom applications (the charge for just the application of materials) separately from the costs of the materials applied. If yes, complete item 4b. If no, skip to Item 5 to obtain the total costs of materials, including the custom application charge.

Item 4b: Custom Application Charge

Record the amount spent for CUSTOM APPLICATION of nutrient or fertilizers on the selected field for the 2017 crop. Include landlord and contractor costs. Record only the application cost. Do NOT include the cost of the nutrient or fertilizer materials. Record the cost in dollars and cents per acre or in total dollars for the field.

If material and application costs can't be separated, record the total in Item 5 and skip Item 4b.

Note: It is common for a combined custom application of nutrient or fertilizer and pesticide to be made at one price. If this is the case, the materials cost shall be listed under nutrient or fertilizer materials cost and an appropriate comment explaining the situation is needed.

Item 5: Total Nutrient or Fertilizer Material Costs

Record the TOTAL COST of MATERIALS for all fertilizer, soil conditioners, micronutrients, etc., applied to the selected field for the 2017 crop of the commodity. If the field was fallow during 2016, include materials applied during the fallow period. Include landlord and contractor costs. **Exclude** the cost of lime or purchased manure. If custom applied, include the cost of materials ONLY, unless materials and application costs cannot be separated.

Note: Even in cases where no nutrients or fertilizers were applied, you must

still ask Item 5. Though micronutrient applications are excluded from the Nutrient or Fertilizer table, the cost of applying them is included here in Item 5.

Item 6: Gypsum

Crops use gypsum as a source of calcium. Calcium contained in gypsum is relatively water-soluble and enters into soil solution. Determine if the operator applied gypsum to the selected field for the 2017 target crop. **Enter** code "1" for YES and continue.

Item 7: Soil Test for Organic Matter

If a soil test for Soil Organic Matter was performed on the selected field in the last 10 years, **enter** code "1" for YES and continue with item 7a.

Item 7a: Percentage of Soil Organic Matter

This question is seeking information on the soil organic matter in this field. Respondents should provide the percentage of soil organic matter from the most recent soil test, if it has been performed during the past 10 years.

Item 7b: Soil Organic Matter Number of Test

Respondents should provide the number of soil tests done in the past 10 years.

Item 7c: Soil Organic Matter Content

Respondents should indicate whether organic matter content is increasing, decreasing or staying the same based on 2 or more soil tests.

Item 8: Soil or Plant Tissue Test

If a soil or plant tissue test was performed for the 2017 crop in the selected field, **enter** code "1" for YES and continue with item 9. If a soil or plant tissue test was not performed, skip to item 13.

Item 9: Phosphorus Soil Test

If a SOIL test for phosphorus was done on the selected target commodity field, **enter** code "1" for YES then ask Item 9a. If no phosphorus soil test was done, go to Item 10. The test may have been done in 2017 or in the Fall of 2016 for preparing for the 2017 crop on the field.

Item 9a: Pounds of Phosphorus Recommended

The results of the phosphorus test usually will be in the form of "recommended pounds of Phosphorus per acre". Ask the respondent what rate of phosphorus application was recommended by the phosphorus soil test. **Enter** the recommended rate in pounds per acre. If the respondent reports in a method other than in 'pounds per acre', make notes on the questionnaire so that the office can convert the recommendation to a standard pounds per acre value.

Item 10: Nitrogen Soil Test

The test may have been done in 2017 or in the Fall of 2016 for preparing for the 2017 crop on the field. If a SOIL test for nitrogen was done on the selected target commodity field, **enter** code "1" for YES then ask Item 10a. If no nitrogen soil test was done, go to Item 11.

Item 10a: Pounds of Nitrogen Recommended

Some nitrogen may be applied as "extra" or "insurance" nitrogen fertilizer. We want to quantify the extent of extra nitrogen applied as "insurance", and whether the number of operators who apply "insurance" nitrogen are offset by the number of producers who respond that they apply less than the amount recommended.

The results of the nitrogen test usually will be in the form of "recommended pounds of Nitrogen per acre". Ask the respondent what rate of nitrogen application was recommended by the nitrogen soil test. **Enter** the recommended rate in pounds per acre. If the respondent reports in a method other than in 'pounds per acre', make notes on the questionnaire so that the office can convert the recommendation to a standard pounds per acre value.

Item 11: Plant Tissue Test

Plant tissue tests are done on plants for nutrient deficiency during or at the end of a growing season. Analysis of plant tissues provide information on how plants are using soil nutrients and help the operator adjust fertilizer applications up or down the following year.

If a plant tissue test was done on plants from the selected field to determine the

needs of the current crop, enter code "1" for YES. Tests may have been performed on the harvested crop (such as the 2016 crop) to determine the needs for this year's crop (the 2017 target commodity crop).

Item 12: Cost of Soil/Plant Tests

Record the total cost in dollars of the soil or plant tissue tests for nutrient deficiency performed on the selected field for the 2017 crop. These tests are typically charged on a per sample basis. The number of samples taken per field will vary depending on the precision the farmer needs for making decisions about nutrient and plant management. Include the cost of tests done in 2016 for the 2017 crop on the selected field. Include landlord and contractor costs.

Sometimes, the farmer is unable to separate the costs of these tests from the cost of fertilizer or custom application charges, especially if the fertilizer dealer or custom applicator does the test. If the fee was included in the cost of the materials or custom applications reported in Section D, leave the cell blank and **complete 12a.**

Item 12a: Reason Test Performed at No Cost

If a soil or plant tissue test was done on the selected target commodity field at no cost, enter the code that best explains why. Use code 2 if the fee was included in the cost of materials or custom application charges. Make sure Section C, Item 4b or 5 is reported. Make notes to explain the 'other reason.'

Item 12b: Payment Received

If payment was received from Conservation Stewardship Program for performing a stalk or leaf tissue test for Nitrogen application, **enter** code "1" for YES and continue with item 13.

Item 13: Reason for Nitrogen Application Rate

Refer back to the fertilizer application table (Item 3). If the table is complete, and no Nitrogen was applied (column 2 contains no entries for N for the selected field), skip to Item 14.

If the table was refused or coded incomplete, ask the respondent if any nitrogen was applied for the 2017 target crop in the selected field.
If nitrogen was applied, complete Item 13.

Items 13a-g obtain the reasons the operator had for deciding how much nitrogen to apply to the selected field. Each of these must be asked. If nitrogen was **not** applied, do not ask this question.

This is not a multiple choice question -- that is, there may not be just one single answer. The operator may have more than one reason for deciding how much nitrogen to apply. Enter code "1" = YES for each reason the operator used.

It is also possible for the operator to say NO to all Items a-g. If this happens, it will be apparent that the operator based decisions on some reason besides those named in Items13 a-g, because these are all NO. Make notes to verify all No response.

In Item 13a, if the operator based the decision on the results of a soil or plant tissue test, enter code "1" for YES.

In Item 13b, if the operator followed the recommendation of a crop consultant, enter code "1" for YES.

In Item 13c, if the operator followed the recommendation of a fertilizer dealer, enter code "1" for YES.

In Item 13d, if the operator followed the recommendation of an Extension Service agent or publication, enter code "1" for YES.

In Item 13e, if the operator based his decision on the expected economic return (the increased return from higher production more than offsets the cost of the nitrogen applied), enter code "1" for YES.

In Item 13f, if the operator followed the recommendation of their Contractor, enter code "1" for YES.

In Item 13g, if the operator decided how much nitrogen to apply based on his own past experience or it was a routine practice for this crop in this field, enter code "1" for YES.

In Item 13h, if nitrogen inhibitors were used in the field collect the amount applied per acre in either pounds (dry) or gallons (liquid).

Item 14: Lime Applications

Determine if the operator ever applies lime to the selected target commodity field. **Enter** code "1" for YES and continue.

Lime is an input applied periodically to a field in order to maintain the soil PH within a desired range. Therefore, the annual cost of lime for crop production depends on the time between lime applications and the amount applied during the most recent application.

Item 14a: Years between Lime Applications

Record the average number of years **between** lime applications to this field. If lime is applied every year, enter "1". If this is the first time lime was ever applied, enter "-1".

Item 14b: Lime Rate

Record tons of lime applied per acre to the selected target commodity field the last time lime was applied. Enter tons to the nearest TENTH (for example, 2.5). If the operator responds in another unit, such as pounds or hundredweight, convert the rate to tons. For example, if the respondent reports 300 pounds per acre, then the number of tons applied per acre is 300 ÷ 2000= .15 tons. Use normal rounding rules and enter .2 in Item 13b.

Item 14c: Lime Applications for Current Year

Determine if the operator applied lime to the selected target commodity in the selected field **during anytime in 2016 or 2017 for the 2017 crop**. **Enter** code "1" for YES and continue.

Item 14d: Lime Cost to Landlord

If the selected field was rented, the landlord may have paid some of the cost of lime and its application. This is more common with share-rented land, but it can also happen in cash and rent-free arrangements.

Note: Since lime is not typically applied to fields every year, this item asks for landlord's share of costs the last time it was applied-- not necessarily the cost in the calendar year of this survey.

Enter percent paid by the landlord.

Item 15: Unprocessed Manure or Other Organic Material Applications

Determine if livestock or poultry manure, biosolids, or other raw nutrients were applied to the selected field excluding compost.

Exclude commercially prepared manure. Commercially prepared manure will have a nutrient analysis and should be included in the Fertilizer Table, Item 3. Commercially prepared manure can be DRIED manure, bagged manure, etc. Very little is used in the production of major crops (corn, cotton, etc.). Some farmers receive manure from brokers, but the overall amount is very small according to past surveys.

Exclude manure 'applied' by animals grazing on the field. Respondents would not be able to accurately quantify the amount of manure deposited by grazing animals. However, you should note on the questionnaire if the field was grazed.

If any type of unprocessed livestock manure (beef, dairy, hog, sheep, poultry, etc.), biosolid, or other raw nutrient was applied to this field, **enter** code "1" for YES and continue.

Item 15a: Acres on Which Manure Was Applied

Record the number of acres of the selected field on which manure was applied. **Enter** acres to the nearest TENTH of an acre.

Item 15b: Amount Applied

Record the amount of manure applied to the selected field. Enter the code for gallons, tons or bushels and units per acre **OR** total units. The unit per acre amount must be entered to the nearest HUNDREDTH (example: 10.85). The total units amount must be entered to the nearest TENTH (example: 25.5). Only one unit should be completed.

If the operator tells you that part of the total amount applied was dry, measured in tons, and part of the amount applied was liquid, measured in gallons, one of these units must be converted. Record this in notes so that the total amount of manure applied to the field can be calculated in the Field Office.

If the operator does not know the amount of manure applied to the field and it cannot be estimated, instead find out the type and number of animals that produced the manure, and for what time period (all or just part of a year). Also find out how many other acres besides the acres of this field were covered with manure produced on the operation. Make good notes of all this information. The Field Office can estimate the amount of manure applied using this information.

Item 15c: When Manure Applied

Timing of manure applications is also an important factor that determines the value of manure applied to the crop and the potential losses of manure nutrients to the environment. This information is important for the policy maker to assess the current timing practices and if needed, to provide incentive for farmers to apply the manure at the time of crop need to protect the environment.

Enter the percent of manure applied in the fall before planting of the target crop in Item 15c(i).
Enter the percent of manure applied in the spring before planting of the target crop in Item 15c(ii).
Enter the percent of manure applied after planting of the target crop in Item 15c(iii).

Note: The total of Items 15c(i) + 15c(ii) + 15c(iii) must equal 100.

Item 15d: Form of the Manure

Determine if the manure was lagoon liquid (code 1), slurry liquid (code 2), or semi-dry or dry (code 3). **Enter** the appropriate code. The valid Manure form codes are:

Code 1 - **Lagoon Liquid**	Lagoon liquid manure is from lagoons or holding ponds.
Code 2 - **Slurry Liquid**	Slurry liquid manure is from in-ground tanks, basins, or pits OR from above-ground tanks, silos, or other manure tanks.
Code 3 - **Semi-Dry or Dry**	Semi-dry or dry manure is from barns, sheds, or embankments.

Item 15e: Application Method

Since dry or liquid application and immediate incorporation affects runoff and nutrients available to the soil, specify whether the manure was applied dry or liquid form with or without incorporation. Also, liquid manure may be injected directly into the soil.

If manure was applied more than once and using different methods of application, record the primary method used. For example: The operator applied 70 % of the manure prior to planting by dry broadcast with incorporation and liquid broadcast without incorporation the remaining 30% after planting...you would code item 15e = 2.

The manure application method codes are:

Code 1 - **Broadcast or sprayed without Incorporation:**	Manure is applied to the entire surface area by land application equipment.
Code 2 - **Broadcast or sprayed with Incorporation:**	Manure is applied to the entire surface area by land application equipment. Incorporation of the manure into the upper soil surface is often performed with a field cultivator, disk, or other tillage implement.
Code 3 - **Injected or Knifed-in:**	Manure is injected under pressure into the soil.
Code 4 - **Sprayed using Irrigation System:**	Liquid manure is applied thru irrigation system.

Item 15f: Type of Raw Nutrient

Different types of raw manure have different nutrient content. Determine whether the major source of the manure applied to the selected field was from beef cattle, dairy cattle, hogs, sheep, poultry, equine, a biosolid (such as municipal waste), or some other livestock.

When the **same** amount of two types has been applied, use the code for the type with the **higher nitrogen value.** The highest value is for poultry, followed by hogs, dairy, sheep and beef. Beef has the lowest nitrogen value.

The code list for the type of livestock manure is:

Code 1 **Beef Cattle**
Code 2 **Dairy Cattle**

Code 3 **Hogs**
Code 4 **Sheep**
Code 5 **Poultry**
Code 6 **Equine** (horse, mule, etc.)
Code 7 **Biosolids** (municipal sludge, food waste, etc.)
Code 8 **Food Waste**
Code 9 **Other** (record the type of manure or nutrient in a note.)

Item 15g: Source of Manure

Determine if the manure was produced on this operation (code 1), purchased (code 2), obtained at no cost from some other source (code 3), or obtained with compensation (code 4).

Item 15g(i): Cost of Purchased Manure

Enter the total cost of manure applied to the field, if manure was purchased. **Enter** the cost per acre or total dollars.

Item 15g(ii)(a): Labor Cost to Custom Apply Manure

Determine if someone was hired to custom apply the manure. If so, record the total cost paid to have manure custom applied to this field. **Enter** the cost per acre or total dollars. **Do not** include custom application cost if it was included with the manure cost.

Item 15h: Testing of Nutrient Content

Manure management has become a major environmental and economic issue in many parts of the U.S. Practices, such as manure testing, are available to help producers manage manure with less risk to the environment. Determine if the manure applied to the selected field was tested for nutrient content prior to application. If manure was tested prior to application, **enter** code "1".

Item 16: Manure Application Rate Restrictions

Because of the increasing regulation of manure applications by Government (Federal, State, and Local) and because regulations are not implemented uniformly, it is important to quantify the extent of farm operators experience with manure regulations. Responses will identify which entity is the most

likely to be doing the regulating, what differences might exist between locales, and to what extent manure applications, when regulated, are being governed by nitrogen or phosphorous application rate protocols.

If the application rate applied to this field was influenced by State or Local restrictions, enter a code "1" and continue with Item 16a.

Item 16a(i) and (ii): Basis for Restrictions

If nitrogen requirement of the crop was the basis of the restriction which influenced the manure application on this field, enter code "1" in Item 16a(i).

If phosphorus requirement of the crop was the basis of the restriction which influenced the manure application on this field, enter code "1" in Item 16a(ii).

Item 17: Non-Commercial Compost Application

Compost is a soil conditioner which provides organic matter for the soil and plant nutrients for crop growth. It is dark-colored humus, a stable organic product from the decomposition of carbon-based feedstock such as wood chips, and nitrogen based feedstock such as raw manures, through the growth and activity of bacteria and fungi. In the decomposition process, these organisms convert chemical energy into heat, which is maintained at a temperature range of 130 and 170 degrees in the feedstocks for a period of time depending on the composting facility.

Determine if non-commercial compost was applied to the selected field. If any compost was applied to this field, **enter** code "1" for YES and continue. If No, skip to Section D.

Exclude commercially prepared compost. Commercially prepared compost will have a nutrient analysis and should be included in the Fertilizer Table, Item 3.

Item 17a: Acres on Which Compost Applied

Record the number of acres of the selected field on which compost was applied.

Enter acres to the nearest TENTH of an acre.

Item 17b: Amount Applied

Record the amount of compost applied to the selected field. **Enter** the code for either tons or cubic yards AND units per acre **OR** total units. The unit per acre figure must be entered to the nearest HUNDREDTH (example: 10.85). The total units figure must be entered to the nearest TENTH (example: 25.5). Only one unit should be completed.

Item 17c: Type of Nutrient

Different types of raw compost have different nutrient content. Determine whether the major source of the compost applied to the selected field was from beef cattle, dairy cattle, hogs, sheep, poultry, equine, a biosolid (such as municipal waste), food waste, crop by-product, or some other source.

The code list for the type of livestock manure is:

Code 1 **Beef cattle?**
Code 2 **Dairy cattle?**
Code 3 **Hogs?**
Code 4 **Sheep?**
Code 5 **Poultry?**
Code 6 **Equine?** *(horse, mule, etc.)*
Code 7 **Biosolids** (municipal sludge)**?**
Code 8 **Food waste?**
Code 9 **Crop?** [Specify: _____]
Code 10 **Other?** [Specify: _____]

Note: Code 9 – **Crop** (record the crop or by-product of the crop)
Code 10 - **Other** (record the type of manure or nutrient in a note.)

Item 17d: Source of Compost

Source of compost is important information for determining the cost of using compost in this operation. Determine if the compost was:

Code 1 Produced on this operation?
Code 2 Purchased?
Code 3 Obtained at no cost off this operation?
Code 4 Obtained with compensation? (Operator received payment for accepting the compost.)

Enter the correct code and continue.

Item 17d(i): Cost of Purchased Compost

Enter the total cost of compost applied in field, if compost was purchased.

Item 17d(ii)(a): Labor Cost to Custom Apply Compost

Enter the code "1" for YES, if someone was hired to custom apply the compost and continue. Enter the total cost paid to have compost custom applied to this field. **Do not** include custom application cost if it was included with the compost cost.

Item 17d(iii): Hauling Distance

Record the number of miles the hauling distance is between the compost storage and the selected field. **Enter** miles to the nearest TENTH (example: a half mile must be entered as: 0.5).

Section D - Biocontrols or Pesticide Applications

Section D Purpose

Biocontrols or Pesticide data are needed because USDA is responsible for publishing estimates of pesticide use in crop production. NASS is charged with collecting these data so that issues related to food safety, water quality, and biocontrols or pesticide cancellation can be evaluated. The Economic Research Service conducts research on the impact of alternative regulations, policies, and practices.

This section is similar to the fertilizer section. Chemical mixes are described and application practices are enumerated. Chemical costs are a large part of the variable production costs for most crops, so getting correct information on chemical usage and costs is important.

Include all chemicals applied for the 2017 crop on the selected field.

Exclude:

1) Chemical applications to fence rows, ponds, canals and ditch banks should not be recorded.

   This land should not be considered part of the survey acres of interest. Often the chemicals used for killing weeds and other pests in these areas are not labeled for use on the crop in the selected field.

2) The use of adjuvants.

   An adjuvant is used in a formulation to aid the operation or improve the effectiveness of the pesticide. Adjuvants include such materials as wetting agents, spreaders, emulsifiers, dispersing agents, foaming agents, foam suppressants, penetrans and correctives. A spray adjuvant may contain one or more surfactants, solvents, solubilizers, buffering agents, and stickers needed to formulate a specific type adjuvant. By using the proper adjuvant it is often possible to use certain biocontrols or chemical pesticides in a tank mix that otherwise would present compatibility problems. However, if you or the respondent is in doubt about whether a product should be included, record it anyway and write notes to explain the situation.

Use of Supplements

The Biocontrols or Pesticide Applications table contains a column for entering the number of applications of a specified pesticide. This column (column 11) allows you to combine multiple applications of the same biocontrols or pesticide, at the same rate, and covering the same area on one line in the table. This procedure should help reduce the need for a supplement.

If more lines are needed than the number available in the table, use the ARMS Phase II **Biocontrols** or **Pesticides Supplement** booklet. Copy the identification as it appears on the main questionnaire to the identification box on the supplement. Assign the next Table number (002, 003, 004, etc.) to each additional supplement used. Begin numbering the supplements with Table 002 because Table 001 already appears in the questionnaire. Use as many supplements as you need.

Use of Records

Because of record keeping requirements for restricted use pesticides, (sometimes called RUP's), most operators will have records of chemical applications for each field. Encourage the respondent to use these records if they are available.

Respondents can answer many of these questions without records. Where records help most is in jogging the farmer's memory about spot treatments, rare, irregular applications or mixes of chemicals, or deviations from usual spray schedules or rates of application.

Use of the Respondent Booklet

Both you and the respondent should use a Respondent Booklet. Most of the biocontrols or pesticide products used on each target commodity are listed in the Respondent Booklet for that commodity. It is very important to obtain the trade name as well as the formulation from the operator to insure that the correct product code is recorded. In order to report the formulation and whether the product is liquid or dry, the respondent may have to look at the product label or detailed itemized receipts for the product.

Some respondents may be willing to use the booklet and to report the product code for each of the products they used. You should encourage this since it makes the job of enumeration easier as well as making reporting faster and more accurate.

To aid in identification, the products in the Respondent Booklet are categorized as LIQUID(L) or DRY(D) formulations. Ask the respondent if the product was in a liquid or dry state when it was purchased. This should help you and the respondent find and record the correct product codes.

The Respondent Booklet also lists the type or class of each product:

- Fungicide (F),
- Herbicide (H),
- Insecticide (I),
- Miscellaneous (M),
- Miscellaneous Biological/Pheromone (MB),
- Miscellaneous Defoliant/Dessicant (MD),
- Miscellaneous Growth Regulator (MG),
- Miscellaneous Soil Fumigant (MS),
- Miscellaneous Defoliant (MD), and
- Other products (O).

Some chemicals and biocontrols or pesticides have more than one use. Some products with more than one use may be listed twice if the second use is associated with a separate product code. For example,

	Gramoxone Extra	
4314	Gramoxone Extra 2.5 L	H
9037	Gramoxone Extra 2.5 L	MD

For products that are listed more than once, be sure to probe for what it was used for and record the product code associated with that use.

Note that each product code listed in the Respondent Booklet specifies the trade name and formulation. The numbers and letters after the product name identify the concentration and form. For example, Canopy 75DF: Canopy is the trade name and the 75DF indicates the formulation. The 75 indicates the concentration as the percent of active ingredient in a pound of product, and the DF indicates that the form of the product is Dry Flowable. For Basagran (4L): Basagran is the trade name and the 4L indicates the formulation. The 4 indicates 4 pounds of active ingredient in a gallon of product and the L indicates a Liquid Concentrate.

Also note that for several products there is more than one formulation for a given trade name: Ambush (2EC) and Ambush 25W or Diazinon 14G and Diazinon 4E and Diazinon 50W and Diazinon AG500(4E). Different formulations of a product have different concentrations of the active ingredient and inert materials.

It is extremely important that you get the correct product code because active ingredient concentrations for different products and different formulations vary greatly. Since we summarize by active ingredient in the product, recording a product or its formulation incorrectly will make a difference when the active ingredient application rate per acre is calculated. For example, if you record the code for Dyfonate II 20-G (1038) when you really should have recorded the code for Dyfonate II 10-G (1037), then we will summarize twice the amount of active ingredient than we should. That will make it look like operators apply more chemicals to crops than they actually do.

Also, if you record the Dyfonate II 10-G code when you really should have recorded the code for Dyfonate II 20-G, we will summarize half as much active ingredient as we should. This is not good either. We need the correct information listed in the questionnaire.

If you cannot find a reported product in the Biocontrols or Pesticide Code List in the Respondent Booklet, complete the table in Item 2 to provide the information needed to classify and summarize unlisted products. The Field Office will research the product and assign a new product code if necessary.

Item 1: Biocontrols or Pesticide Applications

Determine if any biocontrols or pesticides were applied to the selected commodity field for the 2017 crop. Include herbicides, insecticides, fungicides, defoliants, and other pesticides.

IMPORTANT NOTE: If the field has not yet been harvested you must be sure to probe the respondent for any biocontrols or pesticide applications he plans to make to this field prior to harvest and record them in this table.

Exclude fertilizers and seed treatments. The respondent may report foliar fertilizer sprays, especially if they were part of a tank mix. Fertilizer applications should not be recorded in this section; they should have been recorded in the fertilizer section.

Herbicide materials may be applied before weeds emerge or after weeds have emerged. Some herbicides are used to "burn down" or kill weeds prior to planting in no-till systems. Herbicides applied at time of planting are generally applied to the entire soil surface (broadcast). Herbicides requiring soil incorporation may be mixed into the soil by the action of the planter or by attachments which are part of the planter. Incorporation also may be

accomplished by a tandem hook-up of a tillage implement(s) behind the applicator or planter. Other herbicides are effective by being left on the surface without incorporation. Some herbicides may also be used to defoliate the crop prior to harvest.

Insecticide materials are applied to control insects that damage plants by feeding on plant tissues.

Granular insecticides are sometimes applied at planting and placed in the seed row (in-furrow) by a separate attachment.

Fungicides are applied to control disease organisms which affect the growth and development of the plant, such as pod-and-stem blight, anthracnose, brown spot, etc.

Other chemicals are used to fumigate the soil, regulate the growth of the plant, defoliate the crop prior to harvest, etc.

If any pesticides were applied, enter Code "1" for YES, then complete the Biocontrols or Pesticide Table. If no biocontrols or pesticides were applied, make a note to verify a No response and go to Section E.

Column 2: Product Code

Ask the operator to identify the chemical, biocontrols, or pesticide product applied to the selected commodity field. Record the product name for each chemical from the Pesticide Code List found in the Respondent Booklet. This makes it easier to refer to the product, by name, while asking the remaining questions across the table. It also makes it easier to identify a product and its code when the same product is reported more than once with different formulations.

Recording the product name also assists the Field Office in editing the questionnaire and in verifying unusual applications and/or rates. Therefore, you are encouraged to record the product name in the first column.

Each different product applied must be recorded on a separate line. However, if a product is applied more than once at the same rate and to cover the same area, the applications can be recorded on one line, with the number of applications recorded in Column 11.

If two or more products are applied with a single application (tank mix) a separate line must be used for each product. Use Column 4 to identify products applied as a tank mix.

To help the respondent, start by asking if any biocontrols or pesticide products were applied **after the previous crop was harvested or plowed down.** Next, ask about other preplant products and then follow with products applied at planting and then after planting. Remind the operator to report all types of biocontrols or pesticides, including herbicides, insecticides, fungicides, defoliants, growth regulators, and desiccants.

Exclude seed treatments. Most crop seed is treated with an insecticide/fungicide product. If the seed is purchased, seed treatment is done by the seed company prior to delivery to the operator. If the operator uses his/her own seed, it may be treated prior to going to the field or the seed may be treated in the field. Field seed treatment consists of coating the seed with the insecticide or fungicide product just prior to planting.

Column 3: Product Form (Liquid/Dry)

Ask the respondent if the product was in a liquid or dry state when it was purchased. Record an "L" or a "D" in this column to indicate Liquid or Dry. Probe for clarification if the liquid or dry designation listed by the product code selected from the Respondent Booklet does not agree with what you record here for the product.

Common form abbreviations are:

L (Liquid)	These products flow like water. Concentrations are usually expressed in pounds per gallon.
E (EC)	Emulsifiable concentrates. These are usually thicker than water and are mixed with water and applied as sprays. They contain one or more active ingredients, one or more solvents and an emulsifier. Their concentrations are generally indicated in pounds per gallon.
F (Flowable)	These products are in liquid form. They contain finely ground active ingredients suspended in the liquid. They are mixed with water for application. Their concentrations are indicated in pounds per gallon.
D (Dust)	Dusts contain a low percentage of active ingredients on a very fine dry inert carrier such as talc, chalk or clay. They are usually applied directly as purchased. Their concentrations are expressed as percents.
WP (W), SP (S)	Wetable or Soluble Powders. These are dry products, much like flour, which will dissolve or disperse in water. Their concentrations are indicated in percent.
G (GR) (Granular)	Granular products contain active ingredients coated or absorbed onto coarse particles like clay, ground walnut shells or ground corn cobs. The pellets are about the diameter of the lead in a pencil (or larger); during shipment the granules have a tendency to break down and create dust. These are used as purchased. Their concentrations are expressed as percent.
DF (Dry Flowable)	These are small pellets formulated to reduce the dust problem created with granules. They are like wetable powders except that the active ingredient is formulated on a granule instead of a powder. The product pours easily into spray tanks for mixing with water. Their concentrations are expressed as percent.
Bait	Bait products contain active ingredients mixed with food or another attractive substance. Concentrations are expressed as a percentage.

Column 4: Tank Mix

Most chemicals are applied to the field as single products. However, sometimes two or more individual products are mixed in the spray tank by the farmer/custom applicator and applied to the field as a tank mix.

Products applied in a tank mix must be identified as tank mixes. Since there is only space in the table for one product per line, the separate products in tank mixes must be recorded on separate lines. Identify the products in a tank mix by recording in Column 4 the line number of the first product in the tank mix.

For example, consider a tank mix where you recorded the first product on line 6, the second product on line 7 and the last product on line 8. In Column 4 of line 6 you should record 6 so we will know this was the beginning of the list of products in that tank mix. In Column 4 of line 7, you'll record 6 so we know that this product was part of the same tank mix that you started listing on line 6. In Column 4 of line 8, you will record 6 for the same reason.

For products not applied as part of a tank mix, enter a dash in Column 4.

For the first product in a tank mix, be sure to ask each question in Columns 5 - 12. For each additional product in the tank mix after the first product, be sure to ask the questions in Columns 6 or 7 and 8 because the answers likely will be different than for the first product. Information recorded in Columns 5, 9, 10, 11, and 12 should be the same as for the first product in the tank mix. These data can just be copied from the entries in the columns for the first product of the tank mix.

DO NOT confuse tank-mixes and packaged premixes. A tank mix is any biocontrol or pesticide spray which is prepared immediately before use by mixing two or more chemicals and water in the spray tank. Packaged premixes are brand name products that contain two or more active ingredients. These are products where the manufacturer has taken individual active ingredients and combined them in a container. Examples include Ramrod/Atrazine, Lasso/Atrazine and

Bicep (Dual & Atrazine). These manufactured mixes have their own code in the Respondent Booklet, so they don't have to be listed with separate codes for the chemicals included in the product.

New technologies such as variable rate applications that rely on Global Positioning Satellite (GPS) information to control the precise application of chemicals create unique situations. It is possible for an applicator to have more than one chemical product tank, and to apply more than one product unequally across a field depending on the specific needs of each small area. Some areas of the field may be treated with only one of the multiple products. Since the multiple products are not mixed and applied consistently together across the field, these are not considered tank mixes. This use of GPS is still rare.

Figure 7 shows an example of how to record a biocontrol or pesticide and an example of how to record a tank mix.

Figure 7: Recording biocontrol or pesticide tank mix information

APPLICATIONS CODES for column 9	
1 Broadcast, ground without incorporation	6 Chisel/Injected or knifed in
2 Broadcast, ground with incorporation	7 Banded in or over row
3 Broadcast, by aircraft	8 Foliar or directed spray
4 In seed furrow	9 Spot treatments
5 In irrigation water	

CHEMICAL PRODUCT NAME	LINE	2 What products were applied to this field? [Show product codes from Respondent Booklet.]	3 Was this product bought in liquid or dry form? [Enter L or D]	4 Was this part of a tank mix? [If tank mix, enter line number of first product in mix.]	5 When was this applied? 1 BEFORE planting 3 AT planting 4 AFTER Planting	6 OR 7 How much was applied per acre per application?	7 What was the total amount applied per application in this field?	8 [Enter unit code.] 1 Pounds 12 Gallons 13 Quarts 14 Pints 15 Liquid Ounces 28 Dry Ounces 30 Grams	9 How was this product applied? [Enter code from above.]	10 How many acres in this field were treated with this product? ACRES	11 How many times was it applied? NUMBER	12 Were these applications made by--- 1 Operator, partner or family member? 2 Custom applicator? 3 Employee/ Other?
Far-go-granular	01	4211	D	----	1	12.0 0		1	6	5.0	1	2
Banvel (4L)	02	4136	L	2	4		1.0 0	14	1	5.0	1	2
Express (DF)	03	4205	D	2	4	.1 3		15	1	5.0	1	2

In this example,

- Product lines 2 and 3 are in a tank mix.
- For products mixed in a tank mix, columns 4, 5, 9, 10, 11, and 12 must be the same.

Column 5: When Applied

Ask the respondent when the product was applied to the selected field

(before, at planting, after planting, or Defoliation prior to harvest), and enter the appropriate code.

"Before-planting" applications may occur the same day or a week or several months before planting. If a tillage implement is used to incorporate the herbicide into the soil, be sure to record this activity in Section F: Field Operations.

"At-planting" herbicide or insecticide materials are applied at the time the crop is planted. These applications may be band treatments covering a small section of the row over the seed furrow or broadcast treatments covering the entire soil surface.

"After planting" herbicide, insecticide, or fungicide materials are applied after the planting operation is completed. They could be applied a few days or several weeks later.

Column 6 or 7: Application Rate

Column 6 (rate per acre) or Column 7 (total amount) may be used for each product reported. Don't use both on the same line.

Column 6: Rate per Acre per Application

Record the chemical application rate per acre used on the selected commodity field. Rate per acre is the amount used in one application to one acre. Because rates per acre are often quite small with very toxic chemicals, rates are reported to hundredths of units. BE SURE that if whole numbers are reported, zeros are entered after the decimal point.

If an application rate per acre is obtained in Column 6, then nothing should be entered in Column 7.

With variable rate technology and for spot treatments, application rates for a particular product or tank mix may vary across the field. In these cases, **Do Not Attempt to Obtain** a rate per acre instead, obtain the total amount applied to the field using Column 7.

Column 7: Total Amount Applied per Application

If the respondent is not able to report the application rate per acre in

Column 6, use Column 7 to record the total quantity applied per application to all acres treated in the selected target commodity field. This figure should be a total quantity for one application, NOT the "sum total" of multiple applications.

If the respondent is able to give either total quantity applied per application or rate per acre, select the option which the respondent feels will give the most accurate data.

In some cases, respondents cannot report either the rate per acre per application of a product or the total amount of the product applied per application. In these cases, there is one additional way you might be able to collect the data we need. If the respondent knows

1. the amount of the product mixed in every 100 gallons of water,
2. the number of gallons in each tank applied, and
3. the number of tanks used to cover the acres,

Make a note of these figures. The Survey Statistician will be able to calculate the amount of product used.

Other ways of reporting include parts per million (PPM). In these cases, try to find out the amount of actual product (before mixing with water) used, and write lots of notes.

Do not record the spray volume applied to the field. The purchased (concentrated) product is mixed with water and the diluted spray solution is generally applied at rates of 20 - 60 gallons per acre with ground equipment and 5 - 10 gallons per acre by air.

Do not record the inclusion of surfactants or CARRIERS in the spray solution. They are added to the spray solution to enhance the ability of the pesticide to stick to the foliage and/or aid in the absorption into the plant system.

Do not record liquid fertilizer solutions applied in conjunction with a pesticide in the Pesticide Table. The information on liquid fertilizers should be recorded in the Fertilizer Table.

Column 8: Unit Code

Record the units using the unit codes listed in Column 8. The unit

codes are:

Code 1	**Pounds**	Code 15	**Liquid Ounces**
Code 12	**Gallons**	Code 28	**Dry Ounces**
Code 13	**Quarts**	Code 30	**Grams**
Code 14	**Pints**		

Write notes if any unit other than the ones listed is reported.

When the reported unit is quite small, you may need to make conversions. Some conversion factors you may need to use are:

Liquid Products		
1 Gallon	=	4 Quarts
1 Quart	=	2 Pints
1 Pint	=	16 Fluid Ounces
2 Cups	=	1 Pint
1 Cup	=	8 Fluid Ounces

Dry Products		
1 Pound	=	16 Dry Ounces
1 Ounce	=	28.3 Grams
1 Pound	=	453.6 Grams
2 Tablespoons		1 Ounce

BE SURE to keep the unit code and product formulation consistent. If the operator purchased a LIQUID pesticide product, the unit code must be liquid ounces, pints, quarts, or gallons. If a DRY pesticide product (granular, wetable powder, or dry flowable) was used, the unit code must be dry ounces, pounds, or grams. If the form of product conflicts with the reported unit code, perhaps the wrong product code was recorded. Check the Respondent Booklet to see if there are other formulations.

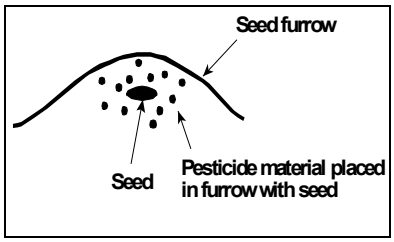
Column 9: How Applied

Obtain the physical application method used to apply the pesticide product to the selected field. The application methods codes are printed in the **APPLICATION CODES** box positioned above Column 9 of the Pesticide Table. Show the respondent the Nutrient or Fertilizer/ Biocontrols or Pesticide Applications Method Codes in the Respondent Booklet.

Herbicides, insecticides, and fungicides are most often applied as broadcast treatments to cover the entire soil surface (or plant surface) with the pesticide material. Band treatments, where a narrow band of pesticide is applied over the row covering about one-third of the soil surface, is also a common method of application. Less frequent methods include in-furrow, with irrigation water, or as spot treatments.

The Application Method codes are defined as follows:

Code 1 - **Broadcast, Ground Without Incorporation**	Pesticide material (herbicide, insecticide, fungicide, or other) is applied to the entire surface area by land application equipment. Application may occur either before or after planting, usually before crop emergence. No mixing of the pesticide material into the upper soil surface is needed or planned as part of the application.
Code 2 - **Broadcast, Ground with Incorporation**	Pesticide material (herbicide, insecticide, fungicide, or other) is applied to the entire surface area by land application equipment. Application usually occurs before planting, and a planned mixing of the pesticide into the upper soil surface is completed at the time or shortly after the time of application. Incorporation of the pesticide into the upper soil surface is often performed with a field cultivator, disk, or other tillage implement. This cultivation activity would also be reported in the Field Operations table.

Code 3 - **Broadcast by Aircraft**	Pesticide material (herbicide, insecticide, fungicide, or other) is applied to the entire surface area by air application equipment. Include only those applications made by airplane or helicopter.
Code 4 - **In Seed Furrow** 	Pesticide material (herbicide, insecticide, fungicide, or other) is placed in the seed furrow **at planting time** generally through a separate attachment on the grain drill. This method is sometimes used for granular insecticides applications. **Do not** confuse this with seed treatments where the seed surface is coated with a pesticide product by the farmer or seed dealer before the seed is put in the planter box. **Do not record seed treatments.**
Code 5 - **In Irrigation Water**	Pesticide material (herbicide, insecticide, fungicide, or other) is mixed with water in either sprinkler or gravity fed irrigation systems. The term used for this procedure is chemigation. The product is metered into the water delivery system (generally a sprinkler irrigation system) and is distributed across the field in the irrigation water.
Code 6 - **Chisel, Injected or Knifed-in**	Pesticide material (herbicide, insecticide, fungicide, or other) is injected under pressure into the soil. This application method (using high pressure) is used with pesticide spray materials for nematode control.
Code 7 - **Banded or Sidedressed in or over Row**	Pesticide material (herbicide, insecticide, fungicide, or other) is placed in or over the crop row. This method is mainly used for row crops. Products are applied **at or after planting**. The area between the rows is not treated. Weed control between rows is accomplished with mechanical cultivation. Application rates for band treatments are to

	be reported on a per acre basis and not the rate that was applied to the banded segment. Band treatments with the same pesticide product normally result in lower application rates than broadcast treatments. For example, if the band only covers one-third of the row, the application rate will normally be about one-third the broadcast application rate. • At or after planting herbicides materials are applied by spraying the product in an 8 to 12 inch band over the crop row. At planting insecticide and fungicide applications are generally placed in a 4 to 6 inch band directly behind the planter shoe and in front of the press wheel.
Code 8 - **Foliar or Directed Sprays**	After planting, pesticide material (herbicide, insecticide, fungicide, or other) is sprayed on or under the plant foliage.
Code 9 - **Spot Treatments**	Pesticide material is applied only to scattered spots in the field, such that the area treated is usually difficult to define. *See the following explanation of the difference between a spot treatment and a partial field treatment.* Spot applications are generally made to control specific weed problems or insects such as grasshoppers at the edges of a field. Spot applications of fungicides are unlikely.

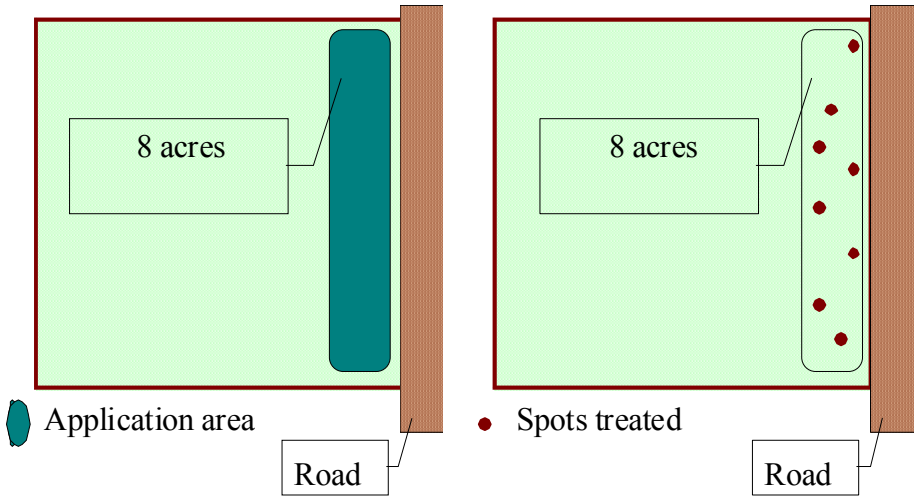
Spot Treatment vs. Partial Field Treatment

Spot treatments should not be confused with treatment of part of a field. When an application is made only to a portion of a field, the treated acreage can be discerned. For example, the north half of a 40 acre field or ten acres throughout a field totaling 20 acres. Such partial field treatments should be reported like any other applications, including acres treated and an application code between 1 and 8.

With spot treatments, rate per acre is impossible to determine. A spot treatment might involve walking or riding around with a tank on the applicator's back, spraying a herbicide on problem weeds. Spot treatments to field crops are rare and should be verified.

If spot treatments were made in the selected field, enter the product code (column 2), product form (column 3), when applied (column 5), the total amount applied (column 7), unit (column 8), application code '9' (column 9), the respondents best guess of acres covered (column 10), times applied (column 11), who applied (column 12), and cost per unit (Optional 4).

Spot treatment example: A farmer with a 40 acre field of target commodity identified a small area along a road with severe thistle infestation, and decided to spot treat these areas with Roundup Ultra. He used 2 ounces to spot treat the thistles over 8 acres of the field next to the road (the respondent best guess is that he spot treated ½ acre).



The line of the biocontrol or pesticide table for this application would be completed as shown in Figure 11.

Figure 11 Recording a **spot** biocontrol or pesticide treatment

APPLICATIONS CODES for column 9	
1 Broadcast, ground without incorporation	6 Chisel/Injected or knifed in
2 Broadcast, ground with incorporation	7 Banded in or over row
3 Broadcast, by aircraft	8 Foliar or directed spray
4 In seed furrow	9 Spot treatments
5 In irrigation water	

CHEMICAL PRODUCT NAME	LINE	2 What products were applied to this field? [Show product codes from Respondent Booklet.]	3 Was this product bought in liquid or dry form? [Enter L or D]	4 Was this part of a tank mix? [If tank mix, enter line number of first product in mix.]	5 When was this applied? 1 BEFORE planting 3 AT planting 4 AFTER Planting	6 OR 7 How much was applied per acre per application?	7 What was the total amount applied per application in this field?	8 [Enter unit code.] 1 Pounds 12 Gallons 13 Quarts 14 Pints 15 Liquid Ounces 28 Dry Ounces 30 Grams	9 How was this product applied? [Enter code from above.]	10 How many acres in this field were treated with this product? ACRES	11 How many times was it applied? NUMBER	12 Were these applications made by--- 1 Operator, partner or family member? 2 Custom applicator? 3 Employee/ Other?
Roundup Ultra	01	4561	L	----	4		2.0 0	15	9	0.5	1	1

Partial field treatment example: A farmer with a 40 acre field of corn decided to treat the area along the road with Roundup Ultra. He applied 4 ounces per acre of the product as a direct spray on the foliage over 8 acres of the field next to the road. The line of the pesticide table for this application would be completed as shown in Figure12.

Figure 12 Recording a **partial** field biocontrol or pesticide treatment

APPLICATIONS CODES for column 9	
1 Broadcast, ground without incorporation	6 Chisel/Injected or knifed in
2 Broadcast, ground with incorporation	7 Banded in or over row
3 Broadcast, by aircraft	8 Foliar or directed spray
4 In seed furrow	9 Spot treatments
5 In irrigation water	

CHEMICAL PRODUCT NAME	LINE	2 What products were applied to this field? [Show product codes from Respondent Booklet.]	3 Was this product bought in liquid or dry form? [Enter L or D]	4 Was this part of a tank mix? [If tank mix, enter line number of first product in mix.]	5 When was this applied? 1 BEFORE planting 3 AT planting 4 AFTER Planting	6 How much was applied per acre per application?	OR 7 What was the total amount applied per application in this field?	8 [Enter unit code.] 1 Pounds 12 Gallons 13 Quarts 14 Pints 15 Liquid Ounces 28 Dry Ounces 30 Grams	9 How was this product applied? [Enter code from above.]	10 How many acres in this field were treated with this product? ACRES	11 How many times was it applied? NUMBER	12 Were these applications made by--- 1 Operator, partner or family member? 2 Custom applicator? 3 Employee/ Other?
Roundup Ultra	01	4561	L	----	4		4.0 0	15	8	8.0	1	1

Note that this application covers a measurable portion of the field and the application method can be described by an application code of 1 through 8. The portion of the field treated does not need to be contiguous to be measurable, i.e., several areas that total 8 acres would be recorded in the same way provided that the applicator adjusted his sprayer to apply at 4.00 ounces per acre.

Column 10: Acres Treated

Record the number of acres in the selected field that were treated with the biocontrol or pesticide product recorded in Column 2. This will be the same as the number of planted acres recorded for the field when the entire field was treated with the biocontrol or pesticide. If only part of the selected field was treated, then enter the number of acres representing the share of the field actually treated.

Here it is important to know the difference between treated acres and treatment acres. **Treated acres** are the actual physical (land) acres of crop which were treated — it doesn't matter how many times they were treated, they are only counted once. **Treatment acres** are the total number of acres covered by applications of a product regardless of whether they are the same acres or different acres.

If the same 40 acres are treated 4 times, the number of treated acres is 40 and the treatment acres is 160 (4 x 40). In this example, 40 acres would be recorded.

Never record treatment acres in these questionnaires.

We account for multiple applications of the same product and formulation in one of two ways:

1. recording each event on a separate line, or
2. combining applications on one line and noting number of times in the next column, column 11.

Acres and tenths of acres must be reported in Column 10. Zero MUST BE recorded after the decimal point if whole acres are recorded. For example, if the operator treated exactly 25 acres, the entry in Column 10 must be 25.0. Otherwise the summary will consider the entry to be 2.5 and we will get serious errors when we summarize active ingredients applied per acre.

Applications done at seeding will normally cover the entire planted acres. However, it is possible for the application to only cover a portion of the field, for different application rates to be used, or for different products to be applied to different areas at planting. When the acres covered by "at seeding" applications does not equal the planted acres, verify this with a note in the margin.

Column 11: Number of Applications

If the same product is applied more than once:

1. At the same rate, (Column 6 or 7)
2. In the same time period before, at, or after planting, (Column 5),
3. Using the same method of application, (Column 9),
4. Covering the same area, (Column 10), and
5. Who made the applications, (Column 12),

then the multiple applications can be recorded on one line. Column 11 is coded with the number of applications of **this** product and at **this** rate.

If the applications were at different rates, during a different time period, a different method, or covering different areas of the field, record each application on a separate line. For example, if 2, 4-D was applied in the Fall, record it on one line. If a second application was made in the Summer, record it separately on another line.

Column 12: Who Applied

For each individual treatment, record who made the biocontrol or pesticide application on the selected field. The codes to identify who applied the chemicals are:

Code 1 **Operator, Partner, or Family Member**
Code 2 **Custom Applicator**
Code 3 **Employee or Some Other Person.**

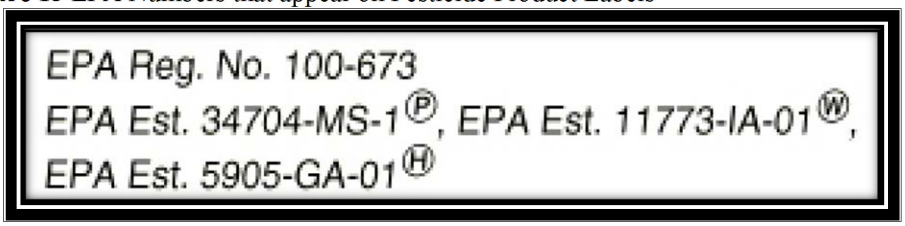
If "who applied" was different for a multiple application line (Column 11>1), use the code for who made the most applications.

Item 2: Information for Unlisted Biocontrols or Pesticides

If you could not find a product in the Biocontrol or Pesticide Code List in the Respondent Booklet when completing Item 1, complete the table in Item 2 to provide the information needed to classify and summarize unlisted products. First, record the line number of the pesticide application that the information refers to. Then record what it was used for (herbicide, insecticide, fungicide). Next record the EPA registration number, if it is available, or the name and formulation of the product. Record whether the product was liquid or dry when it was purchased. Finally, record where the product was purchased. This will assist the Field Office if questions arise about the product and additional information is needed.

The EPA Product Registration number (refer to Figure 13 below) is printed on the product label. These numbers are several digits long and look somewhat like many bank and credit card account numbers, such as 312-19-18713 and 2980-4. EPA Product Registration numbers are not the same thing as EPA Establishment numbers. In this example, the EPA Product Registration number is **100-673**. EPA Establishment numbers (EPA Est.) indicate which companies are also licensed to market the product, but do not uniquely identify the product.

Figure 13 EPA Numbers that appear on Pesticide Product Labels



If the respondent does not know the EPA product number or the trade name and formulation, record as much information about the product as you can, especially the "where purchased." This information will enable identification of the product in the Field Office. The "where purchased" is important because if more information is needed, we can then call the dealer.

For example, if the operator has a biocontrol or pesticide applied by a custom applicator, he/she might not know the formulation of the product, but if the "where purchased" is recorded the Field Office can check to get the correct formulation.

A good, complete entry for Unlisted Products in the notes portion of the section is as follows:

Figure 14 Providing information needed for unlisted pesticide products.

[*For pest control products not listed in Respondent Booklet, specify* --]

Line	**Pest Control Product Type** (*Herbicide, Insecticide, Fungicide, etc.)*	**EPA No. or Tradename and Formulation**	**Form Purchased** (Liquid or Dry)	**Where Purchased** [*Ask only if EPA No. cannot be reported.*]
6	*Insecticide*	*Danitol 2.4 EC, EPA # 39398-17*	*Liquid*	
16	*Fungicide*	*RegulatorII*	*Liquid*	*Midland Chem Supply*

What's in a Registration Number?

All biocontrol or pesticide products, if properly registered, are identified by a unique number which is required to be located on the front panel of the label. This "registration number" is composed of several components, each of which has a specific meaning. These individual components are separated by a "-". Those products registered in California, have an extra component which identifies individual brand name registrations.

Figure 15 Layout of an EPA Registration Number

XXXXXXX- XXXXX- XXXXXXX- XX

1. Firm or Establishment Number - This component identifies the company that is the primary registrant with the USEPA. The number may be as long as seven digits, or as short as 1. California assigns their own unique firm numbers to companies that register products which are not required to be registered by US EPA.

2. Product or Label Number - This five or less digit number is generally assigned sequentially to each company's individual product as it is registered with the US-EPA.

3. Distributor or Sub-Registrant's Number - This number identifies any company that is marketing a product owned by another company, generally the primary registrant. This type of registration is called a distributor registration or a sub-registration and is allowed under existing agreement certified by the USEPA. For a product registered in California, this number represents the company that holds the license for pesticide registration within the state.

4. California Revision Code - California requires companies to register and license individual brand names. The revision code, a sequence of (2) alphabetic letters, creates a unique identifier for each product. A single product may have many brand names registered within the state. Unique revision codes assigned to each one allows for identification of the specific brand name in question. These alphabetic letters may or may not appear on actual product labeling.

Item 3: Biocontrol or Pesticide Custom Costs

You will know if any of the biocontrol or pesticide applications were made by custom applicators by looking at Column 12 in the Biocontrol or Pesticide Table. Ask this question only if any CUSTOM applications were reported (code 2 entered in Column 12).

Item 3a: Custom Application Charge Identifiable

First, ask the respondent if he is able to report the cost of custom applications (the charge for just the application of materials) separately from the costs of the materials applied. If yes, complete item 3b. If no, skip to Item 4 to obtain the total costs of materials, including the custom application charge.

Item 3b: Custom Application Charge

Record the amount spent for CUSTOM APPLICATION of chemicals and pesticides on the selected field for the 2017 crop. Include landlord and contractor costs. Record only the application cost. Do NOT include the cost of pesticides or chemical materials. Record the cost in dollars and cents per acre or in total dollars for the field. If multiple custom pesticide applications were made, report the sum of each custom application cost. For example, if 3 custom applications were made at a cost of $10 per acre each, enter $30 per acre as the custom application cost.

- If material and application costs can't be separated, record the total in Item 4 and skip Item 3b.
- If custom application costs for fertilizers and pesticides cannot be separated, record the total in Section C, Item 4b and make a note.

Item 4: Biocontrol or Pesticide Material Costs

Record the TOTAL MATERIALS cost for all insecticides, herbicides, fungicides, surfactants, wetting agents, defoliants and growth regulators applied to the selected field for the 2017 crop. Include landlord and contractor costs.

If the field was fallow during 2016, include materials applied during the fallow period. Include materials applied to this field before planting. If custom applied, include the cost of materials ONLY, unless materials and application costs cannot be separated. Record the cost in dollars and cents per acre or in total dollars for the field.

Many operators know the cost per acre of chemicals and pesticides applied on their fields. Some operators will have records of chemical applications and the costs of chemicals applied on each field. Encourage the respondent to use records if they are available. You should always attempt to get the best figures from the respondent using this item.

If the operator is unable to report the cost per acre or the total cost for chemical and pesticide materials used on the selected field, use the Dashed Column: Optional Item 4 in the Biocontrol or Pesticide Table. **The Dashed Column: Optional Item 4 should only be used as a last resort**, because operators may have a more accurate figure available that includes materials which are not captured in the Biocontrol or Pesticide Table (such as surfactants and wetting agents).

Section E - Pest Management Practices

Section E Purpose

This section provides data about pest management practices that growers use on their crops, either as alternatives to pesticides or practices which improve the effectiveness of pesticides. With this information, researchers can better analyze the effectiveness and performance of alternative pesticide treatment strategies, and potential impacts on the environment and public health.

Several years ago, USDA, along with the U.S. Environmental Protection Agency (EPA) and the Food and Drug Administration (FDA), presented joint testimony to Congress on a new, comprehensive, interagency effort designed to reduce the pesticide risks associated with agriculture. The threefold goal of this effort is:

1. to discourage the use of higher risk products;
2. to provide incentives for the development and commercialization of safer products; and
3. to encourage the use of alternative control methods which decrease the reliance on toxic and persistent chemicals.

Integrated Pest Management (IPM) is an approach used by farm operators to control pests in an environmentally responsible manner. IPM combines biological, cultural, and chemical methods of pest control such as monitoring of pest populations and use of natural enemies of pests. Other methods of cultural controls are used, including pest resistant crop varieties, traditional plowing and crop rotation, and use of pesticides when necessary.

Some producers may hire professionals to check their fields to determine the presence of pests. Proper identification of pest problems may reduce pesticide usage. These issues relate to and address food safety, water quality, and pesticide regulation. Data from these questions are vital to address these concerns.

Introduction and Definition of Pests

The introductory statement does two things to help the respondent:

1. It explains that you will be shifting gears for a while and asking the operator about pest management practices used on the selected field and how decisions are made regarding those practices.

2. It defines PESTS for the operators to include WEEDS, INSECTS, and DISEASES. Many operators tend to focus on one kind of pest depending on the crop, but we are concerned about other types of pests as well.

   For example, sorghum growers may think only about weeds as pests; cotton growers may focus only on insects as pests.

   In this section, when the word PESTS is used, it refers to ALL three, WEEDS, INSECTS, and DISEASES. If you don't introduce pests this broadly for all operators, operators may answer the questions with only one kind of pest in mind.

If any PESTICIDES were recorded in the Pesticide Table in Section D, then Items 1 thru 3 must be asked. Check back to responses recorded in Section D, Column 2 of Item 1. If no PESTICIDES were used, skip to Item 6 ***(V77 & 79:—Item 4)***.

Item 1: Weather Data to Assist Determining Pesticide Applications

Weather data used by operators to determine either the need or when to make pesticide applications is another form of pest management. By monitoring weather data, the timing of spraying fields may increase effectiveness, allow for a lower application rate, reduce drift, or decrease the total number of applications needed. Temperature and precipitation data can be used to determine whether a chemical application is likely needed. Fungi development is more likely to occur in damp conditions with low temperatures.

If the operator monitored weather data to determine the need for or timing of pesticide applications, **enter** code "1".

Item 2: Biological Pesticides Applied

Determine if any biological pesticides were used for the 2017 crop year. A biological pesticide is a product such as an insect growth regulator, neem, or an active bacteria.

Neem is extracted from the seeds and leaves of the neem tree. The primary mode of action of neem is to cover the plant with this natural pesticide. The insect pests refuse to eat any plant covered with neem, eventually starving to

death. Neem also acts as a repellent and prevents insect reproduction.

The active bacteria, **Bacillus thuringiensis (Bt),** is a natural insecticide found in the soil and acts as a biological pesticide when it is applied to a crop.

If the operator applied any biological pesticides to manage pests, **enter** code "1".

Item 3: Pesticides Rotated or Tank Mixed to Prevent Pest Resistance

A common pest management practice is to rotate (from one year to another) or tank mix chemicals with different mechanisms of action. By "different mechanisms of action" we mean HOW the chemical kills the pest (attacks the nervous system, digestive system, etc.). If the operator rotated products or tank mixed pesticides with different active ingredients to keep pests from becoming resistant to pesticides, **enter** code "1".

Item 4: Were Herbicides Used and Were Herbicides Applied Before Weeds Emerged?

If any HERBICIDES were recorded in the Pesticide Table in Section D, then Items 4 & 5 must be asked. Check back to responses recorded in Section D, Column 2 of Item 1. All herbicide products have a code number in the series 40,000-49,999. If no HERBICIDES were used, go to Item 6.

Pre-emergence herbicides are applied before weeds emerge. Ask the operator if herbicide applications were made on the selected field **before weeds** emerged. If yes, **enter** code "1". If no, go to Item 5.

Item 5: Were Herbicides Applied After Weeds Emerged?

Post-emergence herbicides are applied after weeds emerge. Ask the operator if herbicide applications were made on the selected field **after weeds** emerged. **Enter** code "1" for YES. If no post-emergence herbicides were used, then go to Item 6.

Item 6: Records Kept to Track Pests

V77: Soybeans—Item 8
V79: Cotton—Item 8
Only organized, formal records must be considered not just notes jotted down

on scraps of paper. It doesn't matter who kept the records -- it can be the operator or someone else.

Important Note: If scouting was performed by someone outside of the farm operation, some type of formal record should be provided to the operation. If not, please make a note as to why no records were provided.

If this field was scouted for pests, determine if some type of formal or organized written, electronic, or map records were kept for this field of specific pest activity, infestation levels or numbers of each type of pest listed.

Example: Formal Pest Record

A specific example of keeping formal pest records from a systematic scouting approach comes from the North Carolina Cooperative Extension Service. Three steps are recommended to scout for weeds:

1. make at least 10 stops in each field;
2. at each stop, mark off approximately 30 feet of row (10 paces);
3. record the type and number of weeds found within a 1-foot band in the row. Then record the scouting results on a "weed threshold worksheet" like the one below:

Figure 16 Example of information recorded in written scouting records.

Weed	Number Counted	Number of Stops	Number of Weeds per Stop

The information recorded on the worksheet is used with other information to determine whether herbicide treatment is necessary.

Item 7: Scouting Data Used to Compare to Infestation Threshold Guidelines

V77: Soybeans—Item 9
V79: Cotton—Item 9

This question asks if the operator compared scouting data against published infestation threshold information to determine whether or not to take measures for pest control. With the presence of a pest, an operator may not choose to try to control that pest since it may not reach a damaging level. The crop could possibly outgrow the pest, or natural predators or disease may keep down the pest population. **Enter** code '1' for YES and continue.

Item 8: Method of Pest Scouting

V77: Soybeans—Item 4
V79: Cotton—Item 4

Scouting is the primary method of monitoring pest populations which involves observations of pests in the field in order to estimate population levels. Regular crop scouting lets growers evaluate pest populations ahead of serious problems. Scouting may be done weekly during the growing season and even daily when infestations approach economic levels or weather conditions favor rapid development of specific pests. Scouting is defined as a deliberate effort to assess the pest situation in a whole field, not just in the edge, center, high or low areas. **Enter** the code that best represents the degree to which the respondent scouted to manage pests in the selected field.

Code 1 By deliberately going to the field specifically for scouting activities: The operator deliberately scouts the field based on a planned or scheduled basis.

Code 2 By conducting general observations while performing routine tasks: The operator checks for the presence of pests as routine field tasks are performed.

Code 3 Selected field was not scouted.

Item 9: Established Scouting Process Used

V77: Soybeans—Item 5
V79: Cotton—Item 5

If the operator performed systematic or counting in their scouting routine or used pheromone or other insect lures or traps in the selected field, **enter** "1".

Item 10: Reason for Scouting Selected Field

Item 10a: Pest Advisory Warning

V77: Soybeans—Item 6a
V79: Cotton—Item 6a

Under certain climatic conditions, the potential for pest infestation is higher than normal. The County, Cooperative or University Extension advisor, crop consultant or other advisory source will often issue a pest advisory warning - a recommendation that growers scout their fields for particular pests. If pests were scouted in the selected field due to a pest advisory warning, **enter** "1".

Item 10b: Pest Development Model

V77: Soybeans—Item 6b
V79: Cotton—Item 6b

Pest monitoring consists primarily of "in field" scouting surveys. However, there are also area-wide programs that monitor pest development, population levels, migration and seasonal emergence of overwintering insects. These predictive models are used to forecast the time and development stage of pest infestations. Often, a trapping network is used in conjunction with a predictive degree-day model to forecast insect larval growth and development and predict when growers need to scout for particular pests. If pests were scouted in the selected field because of a pest development model, **enter** "1".

Item 11: Pest Scouting

V77: Soybeans—Item 7
V79: Cotton—Item 7

Column 1: Was Field Scouted for Pests

Determine if the selected field was scouted for weeds, insects or diseases.

For each type of pest for which the field was scouted, enter code "1" = YES, and then ask items in columns 2 and 3, (infestation level) and (who did the majority of the scouting for this type of pest). **Repeat** for each row.

Column 2: Level of Infestation

If the selected field was scouted for weeds, insects, or diseases, record the code which best describes the situation in the 2017 crop year for the pest discovered.

Consider the pest(s) reported with a "YES=1" in column 1; this question asks if the weed, insect, or disease problem was worse than normal in 2017, about normal, or less of a problem than normal.

Record the appropriate code and continue to column 3.

Column 3: Who Performed Scouting for Pests

Ask the respondent who did the majority of the scouting in the field for weeds, insects and mites, and diseases. If two or more people did

equal amounts and there is no clear-cut major "scouter", enter the first (lowest) code of those scouting. If the operator, a partner, or a family member did the most scouting, **enter** code "1".

If most was done by an employee (other than the operator, a partner, or a family member), enter code "2". If most of the scouting was done by the dealer or an employee of a farm supply or chemical company, **enter** code "3". If a hired independent crop consultant or a commercial scouting service was used, **enter** code "4".

If a contractor provided the scouting services for the field, enter code "4" for INDEPENDENT CROP CONSULTANT OR COMMERCIAL SCOUT.

Item 12: Scouting Costs

Ask this question only if a hired supplier, dealer, independent crop consultant, or commercial scout did the majority of the scouting for weeds, insects, or diseases (code "3" or "4" appears in Column 3 of Item 11 on PPCR version, Item 7 on PPR versions). Be sure to **enter** the cost per acre in dollars and cents **OR** the total cost for scouting services ON THIS SELECTED FIELD. Include landlord and contractor cost.

If Column 3 of Item 11(Item 7 on PPR versions) does not contain a code "3" or "4", then go to Item 14(Item 11 on PPR versions).

Item 12a: Scouting Services Provided at No Cost

Sometimes, the farmer is unable to separate the costs of scouting from the cost of pesticides or custom application charges, especially if the chemical dealer or custom applicator does the scouting. If a farm supplier, chemical dealer, independent crop consultant, or commercial scout did not charge for scouting performed for the selected field, be sure to make notes to indicate why there was no fee for the services.

Item 13: Used Field Mapping of Previous Weed Problems

V77: Soybeans—Item 10
V79: Cotton—Item 10
Ask if this operation used field mapping of previous year's weed problems to assist in making weed management decisions on the selected field this year. An operator may have used a topographic map from the National Resource

and Conservation Service (old Agricultural Stabilization and Conservation Service). The operator may simply draw an outline of the field, or may use a software program that allows for field mapping. By identifying trouble spots, the map can help in future pest management program plans. If this practice was used, **enter** code "1" for YES and continue.

Other Pest Management Practices

Items 14 through 21(Items 11 through 16, ***V77: Soybeans, V79: Cotton***) and identify specific practices and strategies used on the selected field for the 2017 target crop as part of an Integrated Pest Management program. For each of these items, it is important to read each question as worded to help the respondent focus on strategies used ON THE **SELECTED FIELD** for the 2017 crop. For most of these questions, the term pest covers weeds, insects, and/or diseases.

Each of these items asks if the operator used the procedure for the purpose of controlling pests on the selected field. If the procedure was used for this purpose, enter code "1" for YES. If the procedure was not used for the purpose of controlling pests, then enter a dash for NO and continue with the next item.

In some cases, the operator may have used a particular procedure, but not for the purpose of controlling pests. If this is the case, probe to verify that the operator's purpose was other than to control pests, by saying, for example, "Did you do that to control pests?" If the purpose for the procedure was not for controlling pests, then the answer to the question is NO and a dashed entry should be made.

Item 14: Use of Other Types of Pest Management

V77: Soybeans—Item 11
V79: Cotton—Item 11
Determine other type(s) of pest management for the specific purpose of managing or reducing the spread of pest in the selected field. **Enter** code "1" for all that apply.

Item 14a: Use of Diagnostic Laboratory

Determine if the operator or a crop consultant utilized the services of a diagnostic laboratory for the selected field. Enter code "1" if YES.

Item 14b: Plow Down Crop Residue

By plowing under crop debris after a crop is harvested, a vital habitat for pests is removed. If the operator used this practice, then enter a code "1" for YES.

Item 14c: Remove/Burn Down Crop Residue

By removing crop debris after a crop is harvested, a vital habitat for pests is removed. Methods of removal could include baling, burning, and removing debris from the field. If the operator used this practice, then enter a code "1" for YES.

Item 14d: Rotate Crops to Control Pests

Find out if crops were rotated in the past 3 years for the purpose of controlling pests. Pest control is only one of several reasons crops could have been rotated. Be sure to probe to ensure that the control of pests was a reason for rotating crops on this field. If the control of pests was a reason crops were rotated, then enter a code "1" for YES.

Item 14e: Maintain Ground Covers

Determine if any ground covers, mulches, or physical barriers were maintained in or around the selected field to reduce pest problems. If this practice was used, enter code "1" for YES.

Item 14f: Consider Pest Resistance When Selecting Crop Variety

Find out if the operator considered pest resistance offered by different crop varieties in selecting the variety planted in this field. Enter code "1" if YES.

Item 14g: No-till or Minimum-till for Weed Control

Determine whether no-till or minimum-till was practiced on this field for weed control during the growing season after the target commodity was planted. If YES, enter code "1".

Item 14h: Planting Location Practices

Another pest management practice is to determine where to plant a particular crop. Crop location can have a negative or positive impact on pest populations. As an example, a wind break could create a

pocket for a certain pest infestation such as flies or weeds. A prominent shaded area can harbor mold or a rot that could also have a negative impact. If this practice was used, enter code "1" for YES.

Item 14i: Adjust Planting or Harvesting Dates

Find out if the planting or harvest date was adjusted on this field for the purpose of controlling pests. If yes, enter code "1".

Item 14j: Chopping, Mowing, Tilling, Burning, etc.

Eliminating habitat where pests can breed and grow is an important pest management strategy. Farmers often mow or otherwise maintain areas immediately adjacent to fields to minimize the habitat where insects live.

Find out if practices such as mowing, burning, tilling, and chopping of field edges, lanes or roadways, were used to slow or control the spreading of pests into the field. If yes, enter code "1".

Item 14k: Cleaning of Equipment

Cleaning of equipment used in a field prevents carrying pests (such as weeds and disease) from one field to another. Find out if the operator cleaned the any equipment used in this field to reduce or prevent the spread of pests to or from the selected field. If yes, enter code "1".

Item 14l: Adjusted Row Spacing or Plant Density

Find out if row spacing (width) or plant density (number of seeds planted per acre) were adjusted in this field for the purpose of controlling pests. Enter code "1" if YES.

Item 14m: Seed Treated

If the seed used on the selected field was treated for insect or disease control after it was purchased, enter "1" for YES.

Item 14n: Maintain Beneficial Insect or Vertebrate Habitat

If the operator maintained a beneficial insect or vertebrate habitat for the purpose of managing or reducing the spread of pests in the selected field, enter "1" for YES.

Item 14o: Maintain Practices to Isolate Organic from Non-organic Crops or Land

A buffer harvest is taken when there are no barriers between organic and non-organic cropland. For example, if an organic apple field is located all the way to a non-organic neighboring field, a certain amount of the organic field has to be harvested as conventional. If the operator maintained buffer strips or border rows to isolate organic from non-organic crops or land (or took a buffer harvest), enter "1" for YES.

Item 41p: Use of Flamer to Kill Weeds

If a flamer was used to kill weeds in the selected field for the purpose of maintaining or reducing the spread of pests, enter "1" for YES.

Item 14q: Early or Late Planting to Avoid Weeds

If the operator planted early or late to avoid weeds in the selected field for the purpose of maintaining or reducing the spread of pests, enter "1" for YES.

Item 15: Beneficial Organisms

V77: Soybeans—Item 12
V79: Cotton—Item 12
If the operator applied or released any beneficial organisms such as nematodes, fungi, insects, etc. in the selected field to manage pests, enter "1" for YES.

Item 16: Biological Pest Control

V77: Soybeans—Item 13
V79: Cotton—Item 13
Biological pest control methods include beneficial organisms (pest predators and parasites) such as floral lures, attractants, repellents, and mating disruption that are used to control crop pests, biochemical agents such as pheromone, microbial organisms such as *Bacillus thuringiensis* (Bt) and other bacteria, viruses, fungi, and protozoa. If this practice was used, enter code "1" and continue with item 16a.

Item 16a: Biological Pest Control Costs

If either item 15 or item 16 = 1 for YES, record the TOTAL materials and custom application costs for all biological pest controls, including pheromone, pheromone traps, beneficial insects, and floral lures, attractants or repellants applied on this field for the 2017 crop.

Exclude seed technology assessment fees. These should be recorded in Section B.

Record in either dollars per acre **or** total dollars. Include any costs paid by the landlord or contractor.

Item 17: Trap Crop

V77: Soybeans—Item 14
V79: Cotton—Item 14
If a trap crop was planted in any part of this field to manage insects, enter code "1".

Item 18: Fallow Insect Control

V77: Soybeans—Item 15
V79: Cotton—Item 15
If this field was left fallow the previous year to help manage insect infestation on this field, enter "1" for YES.

Item 19: Water Management Practices

V77: Soybeans—Item 16
V79: Cotton—Item 16
Water management practices include irrigation scheduling, drainage control, and other water management practices. If water management practices were used to control pests in this field, enter code "1" for YES.

Item 20: Protection of Beneficial Organisms

If pesticide decisions were made to take into account beneficial organisms that were present in the field, enter code "1" for YES.

Item 20a: Timing, Reduction, or Elimination Made in Pest Control Decisions

If the operator changed timing of, reduced application rate of, or eliminated a pesticide application, enter "1" for YES.

Item 20b: Alternative Pesticide, Biocontrol, or Non-Pesticide Practice

If the operator changed to an alternative pesticide, biocontrol, or non-pesticide practice, enter "1" for YES.

Item 21: Yield Loss due to Pests

Determine if pests (weeds, insects, diseases, animals) caused yield loss on this field after the farmer's pest control efforts (such as spraying, tilling, etc.). Enter code "1" for **YES.**

Amount of Yield Loss

If a yield loss was caused by pests (item 21 = 1), enter the amount the operator suspects was loss due to the pests. Select 1 – Bushels or 2 – Tons then give units by acre or total units**.**

Section F - Field Operations, Labor, and Custom Services

Section F Purpose

Machinery information is used to identify tillage systems and residue levels. This allows examination of the impact of the conservation compliance provisions of the most recent Farm Bill on tillage systems, cropping practices, and crop residue levels.

Machinery information is also used to compute the fuel, repair, and capital costs associated with producing the commodity. These items are a significant part of the overall cost of production for each commodity.

Use the checklist at the top of the field operations table to insure the proper operations are recorded.

Field Operations Table

The Objective of the table is to obtain all equipment operations starting after the harvest of the previous crop and continuing through harvest and hauling the target crop from the field to storage or point of sale. Custom operations and pesticide and fertilizer applications are included. In addition, list all secondary product operations, such as those to make and haul straw.

Exclude equipment used to apply lime, gypsum, manure and compost (non-commercial applications).

Use of Supplements

If more operations were completed on the selected field than there are lines available on the questionnaire, use a FIELD OPERATIONS SUPPLEMENT. Copy the identification as it appears on the main questionnaire to the identification box on the supplement. Continue enumerating operations (numbered in sequential order) on the SUPPLEMENT.

Where to Start?

Introduce the topic to the respondent by reading the introductory statement and instructions ("Begin with the first field operation after harvest of the previous crop," etc...).

After making sure the respondent understands which operations to report, begin by asking the respondent what happened after the previous crop was harvested from this field. In most cases, this will be the first tillage operation after harvest of the previous crop from this field.

Abandoned crops: If another crop was planted for the 2017 crop year, but abandoned and plowed under before the target crop was planted, begin with the operation of plowing down the abandoned crop.

Cover crop: If a cover crop was planted in the field after the harvest of the previous crop and plowed under before the target crop was planted, begin with the operation of planting the cover crop. Include any operation done on the cover crop, such as plowing down the cover crop.

New renter: If the operator is a new renter of the field, field operations should be recorded for all operations performed by the renter since the last harvest and he should also report operations performed by another operator, if he knows what operations were done.

Planting on newly cleared land: Field operations should begin to be recorded with land forming and tillage after the clearing.

Replanting the target crop: If the selected target commodity field was planted, plowed up, and replanted due to poor germination, record the operations associated with both plantings, including the operation of plowing down the first planting.

Review the checklist as data are being reported and after completing the Field Operations Table (Item 3). This will insure whole categories of field operations are not omitted.

Item 1: Field Operations

Record field operations performed by equipment in the order they occurred.

- If this field was in fallow (idle, diverted) in 2016, record operations starting with the fall of 2015.
- If a different crop was planted for 2017 but abandoned before the

target crop was planted, begin with the operation of plowing down the abandoned crop.

Exclude

- applications of lime and gypsum
- applications of non-commercial manure
- applications of non-commercial compost

The best way to get the information in this item is to ask the operator to describe all of the field work done for the target commodity field after harvesting the crop previously grown on the selected field.

Start by asking what happened after harvest of the preceding crop and then keep going in the order that the operations were performed. The sequence of operations and implements must be numbered accurately because it is very important for determining residue levels.

Try not to leave blank lines between operations because of the limited space in the table.

NOTE: Include field operations done by neighbors, friends, etc. on a "swap" basis. If these people use their own tractors or harvesters, the tractors and harvesters should be recorded in Item 1 of this section.

After recording operations through planting, continue to list the operations through harvest and hauling of the target crop from this field. Record operations in the order they occurred AND maintain the order of tandem hook-ups. Enter the SEQUENCE NUMBER of each operation in the order it occurred. List all implements used on this field ***beginning with the first trip over the field after harvest of the preceding crop and continuing through hauling it out of the field*** to storage or point of sale.

If this field was fallow (idle, diverted) during 2016, list operations starting with the fall of 2015.

Include:

- plowing,
- corrugation,
- land preparation,
- planting,
- harvesting operations,
- module building operations,
- hauling operations,
- raking and baling operations,
- custom operations, and
- fertilizer(commercially prepared manure) and pesticide applications.

Exclude:

- applications of lime and gypsum.
- applications of non-commercial manure
- applications of non-commercial compost

In sequential order, record all operations performed by tillage, land forming, harvesting, and hauling equipment. **Include the implement used to harvest the target commodity from this field, and trucks, carts, trailers and wagons used to haul the crop from this field to storage or first point of sale.**

Field operations for fertilizer and chemical applications should agree with those reported earlier in Section C and Section D. For example, each fertilizer or pesticide application reported in the Fertilizer Table or in the Pesticide Table should show up here in the Field Operations Table, unless it was applied through the irrigation water (in this case make a note). Custom applications of fertilizers or pesticides should also appear in this section.

NOTE: Though multiple applications of the same pesticide may be recorded on a single line in the Pesticide Table, these applications must be reported separately in the Field Operations table. For example, if the same pesticide application was made twice, (Section D, item 1, column 11 equals 2), then two field operations would be recorded in the Field Operations Table.

If any of the target commodity acres in the selected field were abandoned, all field work done on these acres until they were plowed under or cut should be included. **Exclude** the operations involved with planting a replacement crop other than the target crop.

Include hauling to barns, grain bins, dryers or cleaners. Include hauling the

crop to market directly only if the crop is hauled directly to market from this field. Exclude hauling to market from storage at a later date.

It may help to review the checklist to insure that no field operations were missed.

If the operator uses two or more different cropping practices on the selected field (for example, irrigated and non-irrigated acres) and these have different field operations, be sure to enumerate operations for each of the cropping practices. Record each operation in sequence, entering the number of acres in Column 8 for which each practice was applied.

Completing the Field Operations Table

Column 2: Operation Sequence Number

Correct sequence of the operations over the selected field must be maintained. Enter the SEQUENCE NUMBER of each operation, beginning with number "1" for the first operation after harvest of the previous crop.

Implements in tandem hook-ups should be entered on separate lines. For a tandem or multiple hookup of individual tillage implements, record the first implement of the set in Column 3 and its implement code in Column 4. When you record the second implement on the next line, keep the same SEQUENCE NUMBER in Column 2 that was entered for the first implement in the set. If more than two implements are in such a set, list them in the appropriate hookup order, each one on its own line, and record the same SEQUENCE NUMBER for all the implements in that same set.

For example, you've just enumerated the first operation (a chisel plow) on the selected field. Then for the next operation, the operator tells you that he used a flex-tine tooth connected to a field cultivator. After this operation, the respondent reported that he planted. You would record this as follows:

Example 4: Recording operation sequence numbers

LINE No.	2 SEQUENCE No.	3 What operation or equipment was used?	4 [*Record machine code from Respondent Booklet.*] CODE
01	[87] 1	chisel plow	[88] 01
02	[87] 2	field cultivator	[88] 21
03	[87] 2	flex-tine tooth	[88] 33
04	[87] 3	conventional planter	[88] 114

Sometimes the respondent forgets to report an operation in its right order. When this happens, just add the forgotten operation wherever you are in the table when it is remembered, and enter its correct SEQUENCE NUMBER. Then go back and change the numbers you previously entered to reflect the correct order of machine operations. BE SURE to correct all SEQUENCE NUMBERS that are affected.

The cell numbers do not have to be changed to correspond to the corrected order, only the SEQUENCE NUMBER entered in Column 2.

This is much simpler than erasing and re-entering in the correct order all the operations you had already recorded in Column 3.

For example, you have entered operations 1, 2 and 3 in the previous example, when the operator recalls another operation (a soil finisher) that occurred after the tandem tillage operation and before the planting operation. Correct the SEQUENCE NUMBERS and continue recording operations in order as follows:

Example 5: Correcting operation sequence numbers

LINE No.	2 SEQUENCE No.	3 What operation or equipment was used?	4 [*Record machine code from Respondent Booklet.*] CODE
01	[87] 1	chisel plow	01
02	[87] 2	field cultivator	21
03	[87] 2	flex-tine tooth	33
04	[87] ~~3~~ 4	conventional planter	114
05	3	Soil finisher	66

Column 3: Equipment Used

Record either the operation or the equipment the operator reported, such as a plow, disk, harrow, planter, etc. Continue recording operations or equipment used following planting, such as a cultivator, combine, trucks, wagon or cart, etc. If the operator reports using a machine for which a code is not available, ask the operator which one of the implements in the Respondent Booklet best describes it, or describe the machine as completely as possible in notes.

Enter the name of each implement used on a separate line. Each line entry should indicate one complete pass over the field. Obtaining the total number of passes over a field is an important factor in estimating cost differences between tillage systems.

Try not to leave blank lines due to limited line space. One of the last entries should be equipment used for hauling the harvested target commodity crop from the field to storage or point of first sale.

Record each implement that was used on the field. If an implement was used on only a part of the field, the number of acres it covered will be obtained in Column 8. On some large acreage, two (or more) tractor-implement sets (for example, two tractors and plows) may have been used at the same time to perform an operation. Record each

tractor-implement combination on separate lines and obtain the acres covered by each one in Column 8.

Include custom operations.

For hauling operations, the size recorded in Column 6 should be in pounds, bushels, or tons with the appropriate unit code entered in Column 7.

Column 4: Equipment Code

For each operation SEQUENCE NUMBER in Column 2, record the appropriate implement in Column 3 and the appropriate code in Column 4. The codes are listed in the Respondent Booklet. **If the implement is not listed in the Respondent Booklet, write a description of that implement in notes on the questionnaire. Probe to see if any names in the Respondent Booklet may be applicable.**

For a tandem or multiple hookup of individual implements, record each implement of the set in separate lines and enter the appropriate implement code in Column 4. Maintain the order of tandem hook-ups. Retain the same SEQUENCE NUMBER in Column 2.

Treat the attachment of two implements of the same type (for example, two plows hooked side-by-side) for the purpose of allowing wider coverage with one pass over the field as one implement, not as a tandem or multiple hookup.

Implements that have several tillage components attached to a single frame should be recorded as one implement, not as a tandem or multiple hookup. For example, a "do-all" is a single implement that has disk blades, field cultivator shanks, and some type of harrow mounted on a single frame. Enter the appropriate code for the single implement from the Machinery Code List in the Respondent Booklet.

Only one code should be entered in Column 4, for example, enter code 5 for a moldboard plow.

If an implement is not included in the Machinery Code List in the Respondent Booklet, enter the implement name on the appropriate line in Column 3, and briefly describe the implement in notes. Be as

complete as possible in your description. The equipment will have to be coded in the Field Office based solely on what you record.

PROBE for the specific type of implement so that it can be coded correctly (for example, plow = regular chisel plow; disk = tandem disk; harrow or drag = spike tooth harrow).

For the second (third, fourth, etc.) implements in tandem operations, skip the remaining columns and go to the next operation. Columns 5, 6, 7, 8, 9, and 10 should be completed only for the first piece of equipment in tandem operations.

Column 5: Equipment Operator

Enter the code for the type of worker that performed the operation recorded in Column 3, operating the machine or equipment recorded in Column 4. This information will be used along with the acres covered recorded in Column 9 to determine the labor usage on the field by type of worker. This method of collecting labor within the Field Operations Table saves us from having to count these hours again in the Labor Table. The Labor Table will only account for non-machinery hours.

The types of workers are:

Code 1	**You** (The Operator)	Code 4	**Paid Part-time or Seasonal Worker**
Code 2	**Partner**	Code 5	**Paid Full-time Worker**
Code 3	**Unpaid Worker**	Code 6	**Custom Applicator (hiring a man and machine together to conduct a field operation)**

Include family members in the appropriate category, depending on whether they were UNPAID, PAID PART-TIME or SEASONAL, or PAID FULL-TIME. For example, if the operator's daughter operated the piece of equipment, and she is considered a PAID PART-TIME worker on the operation, then enter code "4". If two people alternated performing a single field operation, record the code for the person who operated the machine over the most acres. If a field operation was performed by someone else, such as a neighbor, in return for work

done on their operation (i.e., traded labor), record the labor used for the field operation as unpaid labor.

A CUSTOM APPLICATOR is a contractor hired to ensure that spray equipment is working properly and applies pesticides or fertilizer in fields. For operations conducted by CUSTOM APPLICATOR, with Code 6 entered in Column 5. Columns 6, 7, 8, 9, 10 and 11 should not be completed for custom operations.

Leave this column blank for the second, third, etc. equipment involved in tandem operations.

Column 6: Equipment Size

Enter the width of the area covered by the equipment on a single pass over the field. **Size means the swath covered by the machine, not necessarily how wide the equipment is.** For instance, a broadcast fertilizer spreader may be only 6 feet wide, but it can spread fertilizer over a swath of 35 feet. In this case, "35" would be the right entry in Column 6, and code "1" for feet should be entered in Column 7. Report size in terms of swath for all machines except for the hauling operations. For hauling operations using trucks, carts, or wagons, record the size in terms of pounds, bushels, or tons according to the size of the equipment item.

Leave this column blank for custom operations and the second, third, etc. items of equipment involved in tandem operations, **unless the tandem operation is a wagon or cart used for hauling**. Since the size of these tandem machines may be different from that of the primary machine, we need to have the size and size unit recorded for tandem machines that are part of hauling operations.

Column 7: Size Code

Enter the code for the unit of width associated with the swath size recorded in Column 6.

The unit codes for width are:
Code 1 **Feet**
Code 2 **Row**
Code 3 **Moldboard** (Bottoms)

For example, if a 4-bottom moldboard plow was used, record "4" as the equipment size in Column 6 and enter code "3" in Column 7.

Unit codes for hauling operations are:
Code 4 **Pounds**
Code 5 **Bushels**
Code 6 **Tons**

Unit codes 4, 5, and 6 should only be used for hauling operations using trucks, trailers, carts, or wagons.

Leave this column blank for custom operations and the second, third, etc. items of equipment involved in tandem operations, **unless the tandem operation is a wagon or cart used for hauling**. Since the size of these tandem machines may be different from that of the primary machine, we need to have the size and size unit recorded for tandem machines that are part of hauling operations.

Column 8: Acres Covered

Record the number of acres covered for this operation on the selected field. Enter the number of acres covered on a single pass of the equipment over the field, not the total for multiple passes of the same equipment over the field. Multiple passes of the same equipment should be recorded on separate lines as separate operations in the correct sequence.

If only part of the field was covered, enter the number of acres in the part of the field covered. If more than one piece of equipment operated on the field at the same time, such as more than one combine doing harvesting, enter each piece of equipment on separate lines, along with the acres covered by each.

Record acres covered to the nearest TENTH of an acre.

Leave this column blank for the second and subsequent equipment lines involved in tandem operations. **Also leave this column blank for land forming and hauling operations**.

Column 9: Hours Spent on Land Forming and Hauling

Land forming equipment includes machines used to make or close

ditches, or to change the slope of the land. The field acreage covered is not a good indicator of total machine use. For **land forming** equipment, Column 9 should be completed by recording the **total hours** that the equipment was used in the target commodity production.

When recording information about equipment used in **hauling** operations, such as carts and wagons, Column 9 should be completed by recording the **total hours** that the hauling activity took for the selected field.

Leave this column blank for the second and subsequent equipment lines involved in tandem operations.

Column 10: Power Source Used

Enter the code (1 - 5) that best represents the tractor used in the selected field based on the power take-off (PTO) horsepower rating. If the operator is not sure of the PTO rating, get a best estimate and write a note in the margin.

If a self-propelled equipment (including harvesters) was used, enter code 99. If two tractors were used simultaneously to pull one piece of equipment, identify both tractors and write a note at the bottom of the page. If horses, mules or other draft animals were used to pull the equipment, enter code 66. If it was pulled by a pick-up, enter code 77. **If a truck other than a pickup is used to pull the piece of equipment, enter the truck code from the Respondent Booklet in column 10. However, if a truck is used for hauling, the truck code from the Respondent Booklet should be entered in column 4, and 99 (self-propelled) should be entered in column 10.**

For example, if a chemical applicator is mounted on the back of a single-axle truck, column 4 would be code 96 and column 10 would be code 301. If a single axle truck was used for hauling, column 4 would be code 301 and column 10 would be code 99.

For the first implement in a tandem or multiple hookup, record the appropriate tractor code used in Column 10. Leave this column blank for the second and subsequent implements in tandem operations.

Also leave this column blank for custom operations.

Column 11: Fuel Type

Enter the code for the type of fuel used by the tractor:

Code 1 – **Diesel**
Code 2 – **Gasoline**
Code 3 – **LP Gas** (Liquefied Petroleum or Propane)
Code 9 – **Other**

In many states, products sold as gasoline contain ethanol. For the purposes of this survey, if the product is sold as gasoline or gasohol, record it as gasoline (code "2"). If the fuel used is ethanol or mostly ethanol, use code "9", and note so in the margin.

How to Record Tandem Field Operations

Often farmers perform two or more field operations at the same time. A common example of this is a spike tooth harrow connected to a regular tandem disk, pulled by one tractor.

Equipment used for fertilizer and chemical applications included in the Field Operations Table may also be commonly done as tandem operations with another operation. Each separate item of equipment must be identified to calculate costs or identify the tillage system used.

When a farmer reports a tandem field operation:

1. Record the first piece of equipment just like any single machine field operation. Record the SEQUENCE NUMBER in Column 2 in order from the previous operation. Enter the data for all remaining columns on that line.

2. On the next line, record the tandem operation in Column 3 and the machinery code of the second piece of equipment in Column 4. Record the same SEQUENCE NUMBER as the operation entered on the previous line in Column 2.

For equipment other than trailers and carts pulled behind trucks, skip Columns 5, 6, 7, 8, 9, 10 and 11 and go to the next operation in sequence. For trailers and carts pulled behind trucks, skip column 5, enter the size and units of the trailer or cart in columns 6 and 7, skip columns 8, 9, 10, and 11 and go to the

next operation.

3. If more than two pieces of equipment were used in tandem, repeat step 2 or each additional piece of equipment.

Be sure each required column is completed for every piece of tillage and/or planting equipment used to prepare and plant the target commodity on the selected field.

NOTE: Columns 6-11 are skipped for custom operations.

Example 1: Field Operations, Tandem and Custom

The following example illustrates how tandem operations would be recorded in the FIELD OPERATIONS TABLE. In this example, you should note that:

- operation 1 occurred in 2015 because the field was fallow in 2016.
- operations 3, 4, and 7 are tandem operations. Columns 5 - 11 are left blank for tandem tillage and chemical application operations.
- operations 4 and 9 are custom operations, leave columns 6 - 11 blank,
- fertilizer and pesticide applications accounted for (operations 7, 9),
- hours (not acres) are entered in column 9 for the hauling operations (operations 11, 12).

LINE No.	2 SEQUENCE No.	3 What operation or equipment was used?	4 [Record machine code from Respondent Booklet.] CODE	5 Who was the machine operator- [Enter code from above.] CODE	[IF CUSTOM (*column 5 = code 6*), *skip columns 6-11*] 6 What was the size or swath of the [machine] used?	7 [Record size unit code.] 1 Feet 2 Row 3 Moldboard (bottoms) Hauling 4 Pounds 5 Bushels 6 Tons CODE	8 How many acres were covered? [Exclude land forming and hauling operations] ACRES	OR 9 How many TOTAL HOURS were spent on land forming and hauling? [Example: backhoes, disk border maker, ditcher, rear mounted blade, trucks, wagons, forklifts, etc.] HOURS	10 Which Power Source was used? 1/ Tractors: 1=(<40 HP) 2=(40-99 HP) 3=(100-149 HP) 4=(150-199 HP) 5=(>=200 HP) Other: 66=Animal Drawn 77=Pick up 99=Self Propelled CODE	11 What was the fuel type of the tractor? [Record fuel type only if Power code equals 1-5] 1=diesel 2=gasoline 3=LP gas 4=other CODE
01	1	stubble mulch	7	1	16	1	165.6		1	2
02	2	stubble-mulch	7	1	16	1	165.6		1	2
03	3	chisel	1	1	16	1	165.6		1	2
04	3	stubble mulch	7							
05	3	cond. harrow	31							
06	4	subsoiler	8	6						
07	4	stubble mulch	7							
08	4	cond. harrow	31							
09	5	heavy cult.	26	1	12	1	165.6		1	2
10	6	heavy cult.	26	1	12	1	165.6		1	2
11	7	heavy cult.	26	1	12	1	165.6		1	2
12	7	fert. attach.	72							

Example 2: Field Operations, Target Crop Abandoned

The following example illustrates coding operations for a target commodity field that is planted, replanted, and then abandoned when target commodity is grown in the selected field. In this example, you should note that:

- all field operations and chemical operations up to the time the decision was made to abandon the field are included.
- the operation of plowing down the crop is not included (this would be the first operation of preparing the field for the next or replacement crop).

					[IF CUSTOM (*column 5 = code 6*), *skip columns 6-11*]					
	2	3	4	5	6	7	8 OR 9		10	11
LINE	SEQUENCE	What operation or equipment was used?	[*Record machine code from Respondent Booklet.*]	Who was the machine operator- [*Enter code from above.*]	What was the size or swath of the [*machine*] used?	[*Record size unit code.*] 1 Feet 2 Row 3 Moldboard (*bottoms*) **Hauling** 4 Pounds 5 Bushels 6 Tons	How many acres were covered? [*Exclude land forming and hauling operations*]	How many TOTAL HOURS were spent on land forming, or hauling? [*Example: backhoes, disk border maker, ditcher, rear mounted blade, trucks, wagons, forklifts, etc.*]	Which Power Source was used? 1/ **Tractors:** 1= (<40 HP) 2= (40-99 HP) 3= (100-149 HP) 4= (150-199 HP) 5= (>=200 HP) **Other:** 66=Animal Drawn 77=Pick-up 99=Self Propelled 1/	What was the fuel type of the tractor? [*Record fuel type only if Power code equals 1-5*] 1=diesel 2=gasoline 3=LP gas 4=other
No.	No.		CODE	CODE		CODE	ACRES	HOURS	CODE	CODE
01	1	subsoiler	8	1	16	1	165.6		2	2
02	2	chisel plow	1	1	16	1	165.6		2	2
03	3	fertilizer	80	1	16	1	165.6		2	2
04	4	cultivator	21	1	16	1	165.6		2	2
05	5	1st planting	106	1	16	1	165.6		2	2
06	6	Pesticide	98	1	16	1	165.6		2	2
07	7	Cultivator	21	1	16	1	165.6		2	2
08	8	2nd planting	106	1	16	1	165.6		2	2

Note: Field Abandoned in July, No Harvest.

Item 2: Labor Used on the Field

Acres covered from the Field Operations Table will be used to calculate labor hours spent operating machines for each field operation. This data will be combined with non-machine labor hours collected in Item 2 to estimate the total labor hours used to produce the target commodity on the selected field. The Labor Table, Item 2, is the only place where labor hours spent on the selected field for activities *other than* operating machines is collected.

Column 1: Type of Workers

First, identify all the workers that worked on this selected field. Include workers who operated machinery in addition to those who did not. Exclude custom and contract workers. Group the workers into types as either: operators, partners, unpaid workers, paid part-time or seasonal workers, or paid full-time workers.

Columns 1a - 1c Hours Spent by Type of Worker

For each type of worker listed, record the total hours worked on **this selected field only** for each of the activities listed in columns 1a, 1b, and 1c. This includes such activities as:

- scouting for weeds, insects, and diseases (Column 1a),
- irrigating (Column 1b)
- other work performed by hand (Column 1c)

If multiple workers of the same type performed an activity, add the total hours that each one worked on the activity. **Include** only the work performed on the selected field. **Exclude** labor provided by contract or custom laborers.

Items 3 & 4: Wage Rate for Paid Workers

For PAID workers only, record the cash wage rate paid for ALL the work performed on this field. **Exclude** payroll taxes and benefits. Hourly wages for part-time or seasonal workers should be recorded in Item 3. Hourly wages for full-time hired workers should be recorded in Item 4. Enter the wage rate in dollars and cents per hour. **Include wages paid to workers operating machines (Item 1, column 5 = 4 or 5) and to workers performing work other than operating machinery (i.e. scouting, irrigating, and other work performed by hand activities).**

If multiple workers of the same type were used, enter the average wage per hour paid to each type of worker. **Do not** multiply the average wage per worker times the number of workers! If two workers are paid $5.50 each per hour, enter 5.50, not 11.00.

If the worker is paid by the week or month, or is paid an annual salary, you will need to probe for an estimate of the average number of hours worked per week, month, or year. Then calculate the hourly wage. For example, if a worker is paid $1500 per month and works an average of 200 hours per month, then compute the hourly wage rate as 1500÷200 = $7.50 per hour, and enter "7.50".

If the worker is paid by the job, probe to be sure this worker is NOT a custom or contract laborer. **Custom and contract work is excluded from this table.**

Item 5 & 5a: Contract Labor Costs

If any contract labor was used in the selected target commodity field, **enter** code "1" for YES in item 5 and **record** the average cost per acre for contract labor on this field in item 5a. Enter the average cost per acre in dollars and cents. Include costs paid by landlords and contractors.

Item 6: Percent of Unpaid Work Done by Those Under 16

Considering the total hours worked by unpaid workers on this field, enter the percent of those hours worked by unpaid workers who were under 16 years old.

Remember that this question is about the percent of ALL the hours worked on this field by UNPAID workers, including unpaid workers identified in Item 1 (operating machinery) and those recorded in Item 2, Column 1a, 1b, and 1c (non-machine hours).

We will value unpaid labor hours dedicated to the target crop with an appropriate wage rate to estimate the economic cost of unpaid labor. Since younger workers are often paid less than more experienced workers, we want to separate unpaid labor hours for workers less than 16 years old so we can value their labor at a different wage rate.

Item 7: Custom Services

Custom operations performed on the field in 2016 for the 2017 crop should be included. Exclude custom fertilizer and chemical applications, and the costs of scouting for pests. These have been recorded in Sections C, D, or E.

Sometimes farmers rent and operate machines themselves. This isn't a custom service, it's machinery rental. Exclude machinery rental from this item. Exclude "swap" labor (work done on the selected operation by a friend or neighbor in return for the selected operator's working on the friend or neighbor's operation). Machines rented and "swap" labor would be included in the field operations table as conducted by someone other than a custom applicator. **Custom services are those cases where the man (labor) and machine are hired together to perform an operation.**

Column 1: Custom Service

Several custom services are listed. Since ALL custom machinery operations were obtained in the Field Operations Table, refer back to the Field Operations Table and identify which custom services listed in Column 1 were performed on the selected field.

Mark the check box in Column 1 for each custom operation reported in the Field Operations Table. Ask Column 2 for each item marked.

Column 2: Cost per Acre for the Custom Service

Record the operation's cost per acre for each custom operation or agricultural service done on the field. Include all custom work service fees paid by landlords and contractors. **Record** the cost in dollars and cents per acre. If multiple operations were done by a custom service, report the sum of the per acre cost of each service. For example, if custom cultivating was done twice, each time at a cost of $25 per acre, report the total cost as $50 per acre.

Item 8: Wheat Dried before Storing or Sale

If the wheat harvested and hauled from this field was dried before it was stored enter a code of "1". This indicator will tell data analysts whether to add wheat drying costs, reported in the phase 3 interview, to the total costs estimated for the phase 2 selected field.

Item 9: Technical or Consultant Services

Items a - g asks a series of questions about the hiring of any technical or consultant services for this field in 2017. **Enter** a code of "1" for all that apply.

Crop consultants, who offer producers recommendations on nutrients, pest control, irrigation, and other cropping practices, are becoming more common. In the past we had only asked specifically about pest scouting services. This question explicitly asks whether a crop consultant was hired for this field and ascertains what type of service was provided. A follow-up question asks about the cost of this service, if the cost was not collected in other sections of the questionnaire.

Item 10: Cost of Technical or Consultant Services

If any "YES" responses recorded for any Items a thru g, record the total cost of these services. Be sure to include landlord/contractor costs but **exclude any of these service costs if they were reported previously** as part of the costs of materials and/or application.

Item 11: Data Collection Tools

If the operator used any data collection tools in the selected field, enter "1" for YES.

Data Collection Tools Used

For each of the data collection tools (11a-h) we want to know if the tool was in use, if the data collected with the tool was connected to a GPS (global positioning system) receiver that collects location information, and if the data and location coordinates were used together to create a map of the data that was collected.

Column 2: Tool Used

Indicate in column 2 which of the column 1 tools were used for data collection on the selected field.

Column 3: Collected with GPS

For each tool used from column 2, indicate in column 3 if the tool

collected data using GPS coordinates.

Column 4: Data Used to Create Map

For each tool used from column 2, indicate in column 4 if the data was or will be used to create a map.

Item 12: Farm Data

After data collection, we want to know how farmers manage their data. Paper copies only (12a.) limit the uses for their data. Computers and mobile devices offer more possibilities for connectivity using the internet. If service providers collect a farmer's data for them (12b.), the data will probably be accessed on the provider's website using the internet. If a service provider's website is used, the potential arises for the farmer's data on the provider's website to be accessed and downloaded by third parties. The last questions (12c. and 12d.) ask if the farmer opted-out of sharing their data in this way or if they specifically intended to share their data with others using the provider's website.

For all categories that apply, enter code "1" for YES.

Item 13: Crop Management Recommendation

After data collection, we want to know if farmers get crop management recommendations based on that data from any of the listed sources.

For all listed sources that provide recommendations, enter code "1" for YES.

Item 14: Yield Monitor

A yield monitor is a device mounted on harvesting equipment (e.g., combine) to measure the yield at regular intervals as the combine moves through the field. These yield measurements may or may not be tied to specific locations in the field through a global positioning system (GPS), which uses information from satellites to pinpoint field locations.

Reasons for Using Yield Monitor

This question asks a series of questions about the use of yield monitor data.
Enter code 1 for all that apply:

a) At harvest the moisture content determines if a crop needs to be dried. Ask the respondent if the yield monitor information was used (or will be used) to monitor the crop moisture on this field.
b) Yields across a field may vary because of drainage problems. Ask the respondent whether the yield monitor information was used (or will be used) to add or improve tile drainage on this field.
c) Yield data from a specific field may be useful in determining the level of payment for leased land. Ask the respondent if the yield monitor information was used (or will be used) to negotiate new crop leases.
d) If the yield monitor information was used for other uses, ask the respondent to specify those uses. Write those uses on the blank line for editing at the Field office.

Item 15: GPS Equipment

Moving on from data collection, storage and interpretation, this question investigates the use of GPS-enabled production equipment. Auto-steering, variable rate application equipment, and "heads-up" displays that are easier for equipment operators to see than standard screens and gauges, all rely on GPS location coordinates from satellites. These are production technologies that may, but do not have to have a data collection function.

For all GPS-enabled equipment listed in a - h, enter code "1" for YES if used.

Section G - Irrigation

Section G Purpose

These questions are designed to identify operating characteristics of irrigation system(s) and the amount and source of water used on the selected commodity field. There can be more than one type of irrigation system used on a particular crop field.

Most irrigation methods use either pressurized or gravity-flow systems. Pressurized systems use various sprinkler or low-flow drip/trickle systems. Gravity-flow systems use various flood or furrow irrigation systems and sub-irrigation systems.

How water is applied depends on the crop, the physical features of the land (slopes, hills, and gullies), the type of soil, the amount of water available, how well special equipment would work, and the cost. To conserve both water and money, farmers try to control the amount of water applied and the distribution of water across a field. When crops are over-watered, minerals are washed from the soil, salts build up and soil erodes. When water is not applied uniformly across a field, crop yield is reduced.

The use of irrigation varies by commodity and region, but irrigation expenses can be significant on farms that must irrigate in order to produce a crop. Information collected in this section is used to compute the fuel, repair, and capital costs of irrigating the target crop on the selected field.

Item 1: Acres of Target Commodity Crop Irrigated in this Field

The respondent should only report the number of acres of the selected crop in the field that were irrigated for the 2017 crop. Record irrigated acres to the nearest TENTH.

Acreage should be counted as irrigated if water was **applied at least once during the growing season** or if the acres were **irrigated before planting**. If only part of a field was irrigated, count only the acres that actually were irrigated. Even though the crop may have received water several times, count irrigated acres only once.

In some states, non-irrigated land may also be called "dryland".

Exclude from irrigated acreage:

- acreage in the selected field which could have been irrigated (facilities were available) but which were not irrigated for the 2017 crop.
- land in and around the selected field in irrigation ditches, trenches, borders, levees and skip rows.
- fringe areas of the selected field (generally in areas with sprinkler systems such as center pivot systems) which did not receive water.

Item 2: Irrigation Operations

Include only the irrigation system(s) used to irrigate the selected field for the 2017 crop year.

You will record information for up to two systems used on the target crop for the 2017 crop year. If only one system was used on this field, then use only Column 1 for responses to Items 2b - 2k. Items 2b - 2k will apply only to the irrigation system type listed in Item 2a.

NOTE: Don't list any system or irrigation technology that wasn't used on the target crop in this field, even if it was used on other fields or other crops on the farm operation.

Item 2a: Type of System

Refer the operator to the Irrigation System Types Codes in the Respondent Booklet and record the System Type Code for the irrigation system used to irrigate acres of the target crop on the selected field during the 2017 growing season.

The Irrigation System Type Codes are:

Pressure Systems

Code 1	Hand-move
Code 2	Solid or Permanent Set
Code 3	Side Roll or Wheel Line
Code 4	Center Pivot or Linear Move With Sprinklers on Main Line
Code 5	Center Pivot or Linear Move With Sprinklers below Main Line, But More than 2 Feet above Ground
Code 6	Center Pivot or Linear Move With Sprinklers less than 2 Feet above Ground
Code 7	Big Gun
Code 8	Low-flow Irrigation (Drip, Trickle, or Micro Sprinkler)
Code 9	Other Pressure System -- Specify Type

Gravity Systems

Code 10 Siphon-tube System from Unlined Ditches
Code 11 Siphon-tube System from Lined Ditches
Code 12 Portal- or Ditch-gate System from Unlined Ditches
Code 13 Portal- or Ditch-gate System from Lined Ditches
Code 14 Poly-pipe System
Code 15 Gated Pipe (Not Poly Pipe)
Code 16 Improved Gated Pipe (Surge Flow or Cablegation, Not Poly Pipe)
Code 17 Subirrigation
Code 18 Open Discharge from Well or Pump
Code 19 Other Gravity System -- Specify Type

Each of these irrigation systems is described in Exhibits 5.1 and 5.2 at the end of this section. The descriptions are designed to explain system characteristics and how the system applies the water to the field.

These systems are on-farm, field-level irrigation technologies and do not describe the water distribution systems of an irrigation district or company.

Exhibit 5.1 includes descriptions of end-tow sprinkler and carousel sprinkler-traveler systems. If either of these systems is used on the field, enter them as a side roll/wheel line system using a code "3".

Also provided are descriptions of several big-gun systems, including self-propelled big-gun system, reel-type hose pull and reel-type cable pull systems that use large gun-type sprinklers. Each of these systems should be entered as a big-gun system using a code "7".

Flood irrigation is a gravity based irrigation system where the water applied is allowed to flow across all or part of a field between levees, dikes, or borders. However, for water management and cost reasons, it is important to recognize how the water is applied to the field. Therefore, the flood irrigation system type can vary depending on how the water is applied to the field. A flood irrigation system can consist of any gravity system type, except system type 17 (and it is also unlikely for system type 16).

For example, if the field was flood irrigated (the water applied is allowed

to flow across the field between levees, dikes, or borders), but the water was applied to the field using a siphon tube or portal/ditch-gate system, then record the flood irrigation system type as either a 10, 11, 12 or 13. Record a code 10 if the field was flood irrigated by applying water from an unlined ditch using a siphon tube system, or a code 11 if the siphon tube system applied water from a lined ditch. Record a code 12 if the field was flood irrigated by applying water from an unlined ditch using a portal/ditch-gate system, or a code 13 if the portal/ditch-gate system applied the water from a lined ditch. If water is applied to the field through a single discharge from a well or pump and allowed to flood all or part of the field (between levees, dikes, or borders), code the irrigation system as 18.

Item 2b: Total Quantity of Water Applied

Record the total quantity of water applied to the target commodity in the selected field during the entire 2017 crop year either (1) in inches per acre, or (2) total acre feet applied to the selected field. Include water that was applied during pre-plant irrigations either to soften the soil for planting or to improve the soil profile.

Record this separately for each Irrigation System Type recorded in Item 2a. Include any pre-plant water application.

Item 2b(i) & 2b(ii): Estimating Water Applied

These items are asked ***only*** if the operator cannot provide a response to Item 2b.

Item 2b(i): Total Hours Water Applied

The operator should estimate the total hours that water was applied to the selected crop in the field during the 2017 growing season. This should be obtained separately for each irrigation system. The total hours the system operated may range from one to greater than 1000 hours.

Irrigation may occur continuously for days, or even weeks. For example, if the irrigation occurs continuously (every day for 5 weeks), then the total number of hours this system irrigated the field was 840. This is computed as follows:

(5 weeks) * (7 days/week) * (24 hours/day) = 840 hours

Another example, if a system was used to irrigate a field three different times during the growing season - once continuously for six days, the second time for eight days (but only from 8 p.m. to 8 a.m. daily), and the third time continuously for six more days - then the total number of hours this system irrigated this field was 384. This is computed as follows:

First irrigation:	6 days (irrigation non-stop, day and night)	6 x 24 = 144 hours
Second irrigation:	8 days (irrigation from 8 p.m. to 8 a.m. daily)	8 x 12 = 96 hours
Third irrigation:	6 days (irrigation non-stop, day and night)	6 x 24 = 144 hours
		Total =384 hours

Item 2b(ii): Average Gallons per Minute

Record the operator's best estimate of the average gallons per minute that the irrigation system(s) applied water to the selected field during the hours of irrigation reported in Item 2b(i). Convert cubic feet per second (cfs) to gallons per minute (gpm) by multiplying by 450, therefore 1 cfs = 450 gpm. NOTE: This value may be the same as the value in Item 2j.

Item 2c: Percent Surface Water Used

Water sources can involve surface water and/or ground water (water from wells). Sometimes the same acres are irrigated using more than one source of water.

Record the operator's best estimate of the percent of all the water used to irrigate the selected field from surface water sources.

Sometimes a single irrigation system uses more than one source of water. For each system type reported in Item 2a, record the operator's best estimate of the percent of the total water the system used to irrigate the selected field from surface water sources. The percent for each system can range from zero to 100 percent.

Surface water is water stored in natural ponds or lakes, flowing in streams and rivers, and water stored in man-made reservoirs. Surface water can originate on the farm or from off-farm sources. Water sources are different from water suppliers. Here, it does not matter who supplied the water to the farm.

Item 2d: Number of Times Field Was Irrigated

The number of times a field is irrigated during the growing season will vary across farms depending upon the system, and other characteristics such as soil type and season weather. The number of times a field is irrigated during the crop year can be useful in estimating both the total quantity of water applied and total costs of irrigation for the field.

Record the number of times the selected field was irrigated during the 2017 crop year. One "irrigation time" is an uninterrupted period the system was actively irrigating the field. Include all applications of water made to benefit the 2017 target crop for the selected field. Include any pre-plant water applications.

For each irrigation system reported in Item 2a, record the number of times each system was used to irrigate the selected field for the 2017 crop. For example, if a system was actively irrigating a field first for 6 days, later for 8 more days, later still for 5 more days, and finally later for 4 more days, then this system irrigated this field 4 times during the growing season.

If the system operated continuously during the crop season, this would be counted as only 1 irrigation. However, if the system operated continuously for 5 weeks, set still (not in operation) for a week (or several days), then operated continuously for another 3 weeks, then the system irrigated this field 2 times during the growing season and would be recorded as 2 irrigations.

The number of times a field is irrigated can also be estimated by the number of times the irrigation system covers the entire field. For example, if a field is irrigated continuously until the entire field is irrigated (that is, it takes 2 days to cover the entire field), and then the irrigation system set still (not in operation) for a period of time, the number of times the field is irrigated during the crop year can be

recorded as the number of times the irrigation system covered the field during the crop year.

Item 2e: Pump Type

To apply water to a field, some irrigation systems may have to lift the water from a well and/or put the water under pressure to distribute it across the field. Pressurized systems must use a pump. For each system reported, identify and **record** the code for the most common pump type used to lift and/or distribute water across the field.

The Codes for Pump Types Are:

Code 1	=	**Turbine**	Code 4	=	**Booster**
Code 2	=	**Submersible**	Code 5	=	**Siphon**
Code 3	=	**Centrifugal**	Code 99	=	**No Pump**

If more than one pump is used with a single system, such as a booster pump, etc., record the pump type for the pump closest to the water source for the field.

Exclude pumps owned and operated by an irrigation company or district even if the respondent is part-owner of the irrigation company.

Sprinkler irrigation systems generally use **centrifugal**, deep well turbine, or **submersible** type pumps. Turbine and submersible pumps are generally used where it is necessary to lift the water more than 25 feet.

Turbine and **centrifugal** pumps differ in the design of the impellers used to move water through the pump. Impellers are devices internal to the pump used to create water force (or pressure) to lift and/or distribute the water across a field.

For an ordinary deep-well **turbine pump**, the impeller is suspended vertically on the end of a drive shaft (submerged below the water level) within a long discharge pipe, but the motor is above ground.

A **submersible pump** is a deep-well pump, usually turbine, with a direct-connect electric motor placed below the submerged impeller. This pump eliminates the need for a long drive shaft required for ordinary turbine pumps. Its principle advantage is that this pump type

can be used in very deep wells or crooked wells where long drive shafts for ordinary turbine pumps are impractical. For the pump type, the motor is submerged.

A **booster pump** is generally a relatively small horsepower pump used to provide added lift or pressure when the pump at the water source does not provide adequate pressure for field water distribution.

A **siphon pump** is generally used to prime a large siphon tube that transfers water from a mainline water-supply to a ditch or canal providing water to the field.

If no pumps were used to draw or apply water to the field (for example water flows by gravity only) enter code "99" and go to Item 2j.

Item 2f: Average Pumping Rate

For each system reported, **enter** the average pumping rate in gallons per minute (GPM) for the pump type recorded for that system. Report the pumping rate(s) used during normal operation. NOTE: This may be the same value as entered in item 2b(ii) above.

Item 2g: System Operating Pressure

If the system type recorded in Item 2a is NOT a Pressure System (codes 1 through 9), skip to Item 2h.

Only ask this item whenever a pressure irrigation system is used (Item 2a is code 1-9). **Enter** the average system operating pressure in pounds per square inch (PSI). Report the system operating pressure used during normal operation.

Item 2h: Pump Motor Type

Systems using a pump to deliver water to the field require a motor. **Enter** the code to identify the fuel or power type for the pump motor type entered in Item 2e.

If a tractor was used, enter the motor type of the tractor.

The codes for motor type are:

Code 1	=	**Diesel**	Code 4	=	**Natural Gas**
Code 2	=	**Gasoline**	Code 5	=	**Electricity**
Code 3	=	**LP Gas**	Code 6	=	**Solar Power**

Item 2i: Average Pump Motor Size

Enter the average horsepower rating of the motor type recorded in Item 2h. For tractors enter the PTO horsepower.

Item 2j: Average Flow Rate

This item is asked only for the system(s) where the respondent indicates that **NO PUMP** was used (code 99 entered in Item 2e).

If no pump was used with a system, then the respondent should estimate the average flow rate in gallons per minute when the irrigation system applied water to the selected field. NOTE: This may be the same value as entered in item 2b(ii) above.

Convert responses in cubic feet per second (cfs) to gallons per minute (gpm) by multiplying by 450, therefore, 1 cfs = 450 gpm.

Item 2k: Other Acres Irrigated Using System(s)

Sometimes an irrigation system is moved during the irrigation season and used to irrigate more than one field or for other crops. For each system type reported in Item 2a, record the **other** acres on this operation irrigated with the irrigation system(s) used to irrigate the selected field during the 2017 irrigation season. Record the number of other acres irrigated to the nearest TENTH.

Exclude the acres for this field.

Item 3: Cost of Fuel or Electricity Used to Irrigate

Fuel and electricity cost for irrigation has been estimated using data about the irrigation system type and use from item 2. Item 3 is being asked in order to evaluate the quality of this data collected directly from farmers relative to that which can be estimated from item 2. Record the per acre cost in dollars and cents per acre **or** the total dollars spent for the fuel or electricity used to irrigate the selected field.

Item 4: Purchased Water

If any water was purchased to irrigate the selected field, **enter** code "1" for YES and continue. If no water was purchased, go to Item 5.

Water is considered purchased if the operator and/or landlord paid a fee for water used on the selected field AND the water originates from an off-farm source. Do not consider water pumped from on-farm sources to be purchased water.

Water may be purchased from many sources, including:

- The U.S. Bureau of Reclamation,
- An irrigation district,
- Mutual, private, cooperative, or neighborhood ditch associations or canal companies, and
- Commercial or municipal water systems.

The purchase fee may be a yearly fee or charges for each application of irrigation water.

Water that comes from an irrigation district, water-supply ditch association, or canal company should be considered purchased water no matter where the off-farm water supplier got the water. These water suppliers generally provide water through canals which are served with water from lakes, reservoirs, or rivers and streams. All water supplied by these organizations should be listed as purchased water. Even if an irrigation district, water-supply ditch association, or canal company does not charge a water fee, but only charges the producer for the cost of water delivery or for the maintenance cost of water delivery facilities, **report the water as purchased water**.

Sometimes a farmer near an area served by an irrigation district is charged a fee by the irrigation district even if the farm doesn't get any water from that district. The fee may be charged because there is a value attached to the groundwater recharge which occurs due to the use of irrigation district water by other irrigators in the area. When the operator pays a fee of this sort, but doesn't irrigate using irrigation district water, do not record the field as being irrigated with purchased water.

Item 4a: Purchased Water Cost

Record either: (1) the per acre cost for purchased water; or (2) the total

cost of ALL water purchased from off-farm water sources that was used to irrigate the **selected target commodity** in **the selected field** for the 2017 growing season. Purchased water costs include water fees and costs to deliver off-farm water to this field.

Include in the expenses associated with purchasing the off-farm water used on the selected field:

- fees associated with the water quantity;
- all fees not associated with water quantities, such as fees charged on a per acre basis to cover water delivery and maintenance costs incurred by the off-farm water supplier; and
- any purchased water costs paid for by the landlord or contractor.

Exclude any costs associated with pumping or distributing the water on the farm or the selected field.

Item 5: Replacement Cost for Siphon Tubes

Ask this item only if a siphon-tube gravity system was used to irrigate the selected field of the target crop during the 2017 growing season (either column of Item 2a is code 10 or 11).

Record the operator's best estimate of the total cost to replace all of the siphon tubes used on the selected field. This item provides data to calculate a cost for the irrigation system.

Item 6: Cost for Poly Pipe

Ask this item only if poly pipe was used to irrigate the selected field of the target crop during the 2017 growing season (either column of Item 2a is code 14).

Record the total expense for poly pipe used to irrigate the selected field. This item is used to calculate a cost for the irrigation system.

Item 7: Gated Pipe System Used

Ask Items 7 and 7 ONLY if a gated-pipe system was reported (either column of Item 2a is code 15 or 16).

Item 7: Average Diameter of Gated Pipe

Record the average diameter of the gated pipe used for irrigating the selected field during the 2017 growing season.

Item 7a: Total Length of Gated Pipe for Field

Record the total length (in feet) of all the gated pipe used to irrigate the selected field during the 2017 growing season.

Item 8: Water from Wells

If water from wells (ground water) was used to irrigate the selected target commodity field for the 2017 crop, enter code "1" for YES and continue. If water from wells was not used to irrigate the selected field, go to Item 9.

Item 8a: Number of Wells

Record the number of wells used to irrigate the selected field during the 2017 growing season. The wells could have irrigated other fields, but they must have at least partly irrigated this field.

Item 8b: Average Well Casing Diameter

Record the average diameter of the outer well casing of all wells that irrigated the selected field during 2017. The average diameter of the outer well casing will probably be between 12 and 36 inches; 20 inch casings are relatively standard throughout much of the West. Do not record the average diameter of the well column pipes (the well pipes pumps are attached to).

Item 8c: Average Pumping Depth

Record the average pumping depth (in feet) of wells that irrigated the selected field during 2017.

Well pumping depths depend on the water table level and the amount of draw down on the water table during pumping. In other words, pumping depth is the depth to water at the start of the irrigation season, plus an average decline in the water level caused by pumping during the irrigation season.

Item 8d: Other Acres Irrigated From These Wells

Often a well may be used to supply water to more than one field. If

other acres were irrigated using water pumped from the same well(s), **enter** code '1'.

Item 8e: Acres Irrigated

Record the number of **other acres** (for acres other than the selected target commodity field) that were irrigated using water pumped from the well(s) that supplied water to the target field.

Exclude acres in the selected field.

Item 9: Additional Pipe Used

This question finds out if any other pipes besides pipe that was part of the irrigation system itself was used to irrigate the selected field during 2017. Additional pipe includes mainline or lateral pipe but not the pipe that is in the system itself. If additional pipe was used on the selected field, **enter** code "1" for YES and continue.

A mainline pipe connects the pump or water source and the field or the lateral pipes. Mainline pipes can be either portable or buried in the ground. Lateral pipes are pipes that carry water from the mainline pipe to the discharge or distribution point in the field. There can be more than one lateral pipe, and they can be permanent or portable.

Item 9a: Average Diameter of Additional Pipe Used

Record the diameter in inches of the additional mainline or lateral pipe used. If there are different diameters of pipe used, record the average diameter in inches.

Item 9b: Feet of Additional Pipe Used

Enter the total feet of mainline or lateral pipe used to carry water to the selected field during 2017. **Exclude** pipe that is part of the irrigation system, such as gated pipe, sprinkler pipe, etc.

Exhibit 5.1: Types of PRESSURE Irrigation Systems

Hand-move Sprinkler System (Code 1)	Portable pipe system, usually aluminum pipe, which must be moved by hand one or more times per day during irrigation periods. Irrigation requirements of the field are met by successive moves of the system to water one strip of the field at a time (an irrigation set). The system's sprinklers can use a variety of orifice sizes and configurations. The system may be adapted to most soil types, topography, field size and shapes; however, it is not suited for all crops since tall crops, such as corn, hinder pipe movement. The sprinkler line(s) are served water by mainlines of aluminum or PVC that may be buried or above ground.
Solid-set or Permanent Sprinkler Systems (Code 2)	A buried pipe system with only the risers and sprinklers above ground, or a portable pipe system which is placed in the field at the start of the irrigation season and left in place to the season end. Both of these system types require no labor to move the system to a new location once established for the irrigation season. Adapted to most crops, soil types, topography, field sizes and shapes.
Side-roll or Wheel-line Sprinkler Systems (Code 3)	A wheel-move, lateral-line system which moves as a unit in fixed increments (irrigation sets) across the field. The system is powered by a small gasoline engine that is manually operated. The system is stationary while irrigation is taking place. Some variations of the system may have tow lines trailing the main lateral line with additional sprinklers on each tow line. Tow line systems irrigate a wider strip at each set, up to 180 feet compared to the 60-foot strip of standard side-roll systems. Wheels are generally spaced 40 feet apart and are 5-7 foot in diameter, with the main system pipe serving as an axle in the middle of the wheel. The system is designed for reasonably flat, rectangular or square fields and is suited to crops less than 4 feet in height. The sprinkler may use flexible hose, aluminum pipe, or PVC pipe to connect to mainlines (above or below ground) or on-site pressurization pumps.

End-tow Sprinkler System INCLUDE as a side-roll system (Code 3)	Wheel or skid, lateral-line system which is end-towed via tractor to new locations in the field. The system is stationary while irrigation is taking place. System is designed for reasonably flat or slightly rolling, rectangular or square fields with an alley through the center of the field. Designed for hay and pasture irrigation, the system may be used on some row crops and orchards.
Carousel Sprinkler-traveler System INCLUDE as a side-roll system (Code 3)	Wheel-mounted system with a rotating boom that sprinkles or sprays water. The system may be self-propelled with a mounted engine, or towed via pick-up or tractor to the next field location (irrigation set). Water is supplied to the system by hose or supply ditch.
Center Pivot or Linear Move with Sprinklers on Main Line (Code 4)	Self-propelled, continuous-move sprinkler system that either travels in a circle (center pivot) or laterally (linear move) across a field. Sprinklers are located directly on the system's main water-supply pipe, which is supported by A-frame towers. Some circle systems have features that provide coverage of most of the corners on a square field. Some systems may be towed to adjacent fields to increase system use by irrigating a different crop with different timing of water needs. Water is delivered to a fixed center point for center-pivot systems and by hose or supply ditch for lateral move systems. Center-pivot systems have been developed for areas from 40 to 240 acres, but most systems irrigate 128-132 acres of a square 160 acre field. Lateral moves require a square or rectangular field of 40 to 240 acres. These systems may be adapted to most crops, soil types, and level to gently-rolling topography. Systems with sprinklers directly on the main water-supply line will tend to be medium to higher pressure (above 30 psi) and use impact sprinklers.

Center Pivot or Linear Move, with Sprinklers below the Main Line, but More than 2 Feet above the Ground (Code 5)	Self-propelled, continuous-move sprinkler system that either travels in a circle (center pivot) or laterally (linear move) across a field. Sprinklers or sprayers are located on drop-tubes or booms suspended below the system's main water-supply pipe, but more than 2 feet above the ground. This includes most standard drop-tube sprinkler systems. Some circle systems have features that provide coverage of most of the corners on a square field. Some systems may be towed to adjacent fields to increase system use by irrigating a different crop with different timing of water needs. Water is delivered to a fixed center point for center-pivot systems and by hose or supply ditch for lateral move systems. Center-pivot systems have been developed for areas from 40 to 240 acres, but most systems irrigate 128-132 acres of a square 160 acre field. Lateral moves require a square or rectangular field of 40 to 240 acres. These systems may be adapted to most crops, soil types, and level to gently-rolling topography. Systems with sprinklers below the main water-supply line will tend to be lower pressure (below 30 psi), with spray nozzles rather than impact sprinklers.
Center Pivot or Linear Move, with Sprinklers less than 2 Feet above the Ground (Code 6)	Self-propelled, continuous-move sprinkler system that either travels in a circle (center pivot) or laterally (linear move) across a field. Sprinklers or sprayers are located on drop-tubes suspended below the system's main water-supply pipe and are located less than 2 feet above the ground. This includes low pressure precision application systems (LEPA) and other below-the-crop-canopy systems. Some circle systems have features that provide coverage of most of the corners on a square field. Some systems may be towed to adjacent fields to increase system use by irrigating a different crop with different timing of water needs. Water is delivered to a fixed center point for center-pivot systems and by hose or supply ditch for lateral move. Center-pivot systems have been developed for areas from 40 to 240 acres, but most systems irrigate 128-132 acres of a square 160 acre field. Lateral moves require a square or rectangular field of 40 to 240 acres. These systems may be adapted to most crops, soil types, and level to gently-rolling topography. Systems with sprinklers suspended to within 2 feet of the ground tend to be very low pressure (below 15 psi) and use spray nozzles and bubblers. Some units may run water

	directly on the ground using a cloth-like extension attached to the drop tube.
Big Gun (Code 7)	A single, large gun-type sprinkler mounted on a trailer, carriage, or skid. Water is supplied to the sprinkler through a flexible hose. The mounted gun sprinkler is either pulled across a field or moved across a field using a self-propelled drive system for each irrigation set. An irrigation set is the area of the field that is irrigated by the gun sprinkler as it moves across the field. When an irrigation set is completed, the entire system is moved and the process repeated. The system is designed for straight rows, flat topography, and medium to high infiltration soils. It is best suited for crops that can withstand heavy bursts of water. Systems are high pressure, greater than 60 psi. Three specialty-type big-gun systems are defined below, including a self-propelled gun traveler system, a reel-type hose pull system, and a reel-type cable pull system.
Self-propelled Gun Traveler INCLUDE as a big gun system (Code 7).	Single, large gun on a four-wheel trailer. Self propelled by a separate engine or a hydraulic continuous move. Water is supplied through a flexible hose. Systems are high pressure, greater than 60 psi.
Reel-type Hose Pull INCLUDE as a big gun system (Code 7)	Single, large gun-type sprinkler on a carriage. A flexible, but non-collapsible hose is attached to a large reel at one end of the field. The carriage and sprinkler is attached to the unrolled hose and stationed at the other end of the field. Water movement through the hose activates a drive system that rolls the hose on the reel, drawing the sprinkler and carriage across the field. When an irrigation set is completed, the reel, sprinkler, and carriage may be moved and the process repeated. Systems are high pressure, greater than 60 psi.
Reel-type Cable Pull INCLUDE as a big gun system (Code 7)	Similar to hose-pull system, except a cable is used to reel the gun-type sprinkler and carriage across the field. This enables a flexible, collapsible hose to be pulled behind the carriage. When an irrigation set is completed, the cable, reel, hose, sprinkler, and carriage may be moved and the process repeated. The system often requires a grass strip to operate on since the hose is pulled behind the unit. Systems are high pressure, greater than 60 psi.

Low-flow Irrigation System (Drip, Trickle, Micro Sprinkler) (Code 8)	Low-pressure systems designed for frequent water applications using small-diameter tubing and low-volume emitters to distribute water directly to the crop root zone. Tubing and emitters can be installed below ground, under plastic or mulch, or above ground, and alternatively, tubing may be installed below ground with emitters on risers above ground. While used primarily on trees, vines, and vegetable crops, these systems are only in limited use on field crops due to the high initial capital costs. Drip and trickle systems have been adapted to all crop types; micro-sprinklers are generally used on perennial crops where a larger wetted area is needed to encourage root development. These systems are adaptable to most soils and may be used on topography where slope prevents irrigation from other system types.

Exhibit 5.2: Types of GRAVITY-FLOW Irrigation Systems

Siphon-tube System with Unlined Ditches (Code 10)	System uses short curved tubes, usually aluminum or plastic, to siphon water onto a field from an unlined ditch across the head of the field. Siphon tubes are curved to fit over the ditch bank and most range from 1 to 3 inches in diameter and from 3 to 5 feet in length. Water, once on the field, may flow down furrows, between borders or dikes, or in corrugations. The unlined ditch is formed with mechanical operations using only the soil on the field. The ditch may be reformed each year or reused with maintenance.
Siphon-tube System with Lined Ditches (Code 11)	System uses short curved tubes, usually aluminum or plastic, to siphon water onto a field from a lined ditch across the head of the field. Siphon tubes are curved to fit over the ditch bank and most range from 1 to 3 inches in diameter and from 3 to 5 feet in length. Water, once on the field, may flow down furrows, between borders or dikes, or in corrugations. The ditch may be lined with concrete, plastic, clay, or other nonporous material. The ditch is permanent and is reused each year.

Portal- or Ditch-gate System with Unlined Ditches (Code 12)	System uses openings in the ditch bank, either portals with covers or tubular openings closed with a gate, to discharge water onto a field from an unlined ditch across the head of the field. Portals in the ditch bank can be of any diameter and are covered with a metal, plastic, or wood cover to regulate water flow onto the field. Ditch openings can be any size, including openings for the entire flow of the ditch, and water-flow control gates can be made of wood, metal, plastic, or canvas. Water, once on the field, may flow down furrows, between borders or dikes, or in corrugations. The unlined ditch is formed with mechanical operations using only the soil on the field. The ditch may be reformed each year or reused with maintenance
Portal- or Ditch-gate System with Lined Ditches (Code 13)	System uses openings in the ditch bank, either portals with covers or tubular openings closed with a gate, to discharge water onto a field from a lined ditch across the head of the field. Portals in the ditch bank can be of any diameter and covered with a metal, plastic, or wood cover to regulate water flow onto the field. Ditch openings can be any size, including openings for the entire flow of the ditch, and water-flow control gates can be made of wood, metal, plastic, or canvas. Water, once on the field, may flow down furrows, between borders or dikes, or in corrugations. The ditch may be lined with concrete, plastic, clay, or other nonporous material. The ditch is permanent and is reused each year.
Poly Pipe System (Code 14)	A system using a flexible, collapsible, plastic (polyethylene) tube up to 18 inches in diameter. The poly-tubing is unrolled along the head of the field and holes punched or closeable gates installed to match furrow, border, or dike width. A well or supply canal provides water to the tube. The tube is installed at the beginning of the irrigation season, and since it lays flat when not in use, can remain in the field the entire season. The tubing may be reused for more than one year, but single season use is most common.

Gated Pipe (Not Poly) (Code 15)	A system using rigid PVC plastic or aluminum pipe with manually-operated closeable gates at regular intervals. The pipe is installed at the head of the field, but may need to be removed for cultural operations or moved to new field locations through the season. The gates usually match row widths so water can flow directly into rows. Gated-pipe systems may also be used on flood or corrugation water-control systems. The pipe is reused for many years.
Improved Gated Pipe System (Surge Flow or Cablegation, Not Poly) (Code 16)	A system using rigid PVC plastic or aluminum pipe with manually-operated closeable gates at regular intervals, but with an automated water-control system. Automated water control is achieved by (1) using a surge valve to alternate pipe sets receiving water, (2) using a moveable plug inside the gated pipe, controlled by a cable, to adjust the water flow from open gates, or (3) other automated methods using gated pipe to control water flow and improve the uniformity of water applications, such as pneumatically controlled bladders to regulate water flow on individual gates. Gated pipe is installed across the head of the field, but may need to be removed for cultural operations or moved to new field locations through the season. The gates usually match row widths so water can flow directly into rows. Improved gated pipe is very unlikely to be used for flood irrigation. It would defeat the purpose of the improved system. The pipe is reused for many years.
Sub-irrigation (Code 17)	Maintenance of a water table at a predetermined depth below the field surface by using ditches or sub-surface drains and water-control structures. Water is added or removed as needed to maintain the water level of the water table at a specific depth using the ditches or drains. Lateral movement of water through the soil provides water to the crop root zone. Conditions for use of this system are limited. Land must be flat and suitable for rapid lateral water movement. The irrigation system may also be used as a drainage system.

Open discharge from well or pump (Code 18)	Open discharge from well or pump occurs where there is only one point of discharge into the field. This system is often used in conjunction with levees or dikes to maintain an even water depth throughout the field. The water remains on the soil until irrigation needs are meet, at which time the water is either drained from the field or allowed to infiltrate the soil. Land forming is often required with this system.

Section H - Conclusion

Item 2: Location of Selected Field

Tell the respondent that you need to mark the location of the selected field of the target commodity on a map.

Ask the respondent what county the selected field is located in, and record the county name in the space provided.

A field description box has been added for your use in better describing the location of the field.

Location of the Selected Field

Field location boxes for your use in recording the Latitude and Longitude of the field. To obtain the latitude and longitude, enter the sample field 15 paces. Using the GPS unit, record the latitude and longitude. Where *dd*=degrees, *mm*=minutes, and *ss*= seconds.

Using the GeoMapLive application on the enumerator's iPad, have the respondent visually identify the center of the field on the aerial image. Record the latitude and longitude as degrees, minutes, and second. Minutes are between zero and 60. Seconds are between zero and 60. (Do not record decimal degrees.)

The survey asks about field location so that other geospatial data – such as detailed soil characteristics and weather data – can be linked to the survey responses for statistical analysis of factors that impact farm production decisions and costs.

If the latitude and longitude readings are NOT recorded, the field MUST be mapped on a county map as described in Item 3 below. If the latitude/longitude is recorded, DO NOT mark the target commodity field on the county map.

Item 3: Marking Field Locations on the Map

NOTE: If you do not have a map for the county the field is located in, you should contact the Field Office or your Supervisor to obtain the correct map. Be sure to record enough information (such as legal description,

township, range, section, etc..) from the respondent to allow you to locate the field on the correct map when you receive it.

Mark the location of the selected field of the target commodity with an "X" on the county maps provided by the Office. Verify with the respondent that you have located the field correctly. Be sure that the "X" you mark on the map is in the county named in Item 1.

Item 4: Re-contact in the Spring 2018

Inform respondents that they will be re-contacted in January of 2018 to collect additional information to complete the profile of their operations for the Agricultural Resource Management Survey. Explain that you will be asking about entire year and year-end information at that time, and it will be easier to collect these figures when their records for 2017 are complete.

It is important that you leave the interview on a good note and that you put the Spring contact in as positive light as possible. After the first of the year, when records are complete and individual receipts and record book line items have been summarized, collecting the information will be easier and take less time. It would be difficult to answer the Spring questions right now, because records are incomplete.

It is important to retain the respondent's cooperation for the Spring interview, because very limited use of the respondent's Production Practices and Costs data can be made if data from the Spring interview is not available. Information would be lost to the ARMS, and this operation would not be represented in the full Agricultural Resource Management Survey. More importantly, the hundreds of similar operations the selected farm represents would not be reflected in official USDA estimates.

Emphasize that you will call to make an appointment for a time convenient to the respondent for conducting the Spring interview.

Item 5: Survey Results or Other Agency Publications

After completing the interview, offer the results of the survey or other Agency or Field Office publications to the respondent. A number of publications will result from the ARMS, and they will be published in a variety of sources. Many of these are explained in Chapter 1 of this Manual. In addition, there may be other releases from NASS or your Field Office that responding farm operators may be interested in. We would like to serve the respondents better

by providing survey results and other information that they will find useful and interesting.

Your Survey Statistician will explain which publications from Headquarters or from your Field Office to offer to participants in the ARMS. The Survey Statistician will instruct you how to record requests for information from each respondent, if any Release order forms need to be filled out, or if any additional coding is required on the questionnaire.

If the respondent would like a free copy of the survey results, **enter** a code '1' in cell 9990.

Item 6: Ending Time

Record the ending time of the interview in cell 0005. If more than one person was interviewed or it took more than one appointment to complete the interview, times should reflect the approximate total time for the questionnaire. Exclude the time you spend reviewing the questionnaire or verifying calculations by yourself after you have completed the interview. Be sure the ending time is after the beginning time entered on the face page. Use military time.

Items 7a, 7b, 7c: Records Use

Do not ask these remaining questions of the Respondent. They are only for administrative purposes and analysis. You should fill them out after the interview is completed.

Analysts and other data users are interested in comparing reported data with the use of records. The use of records should indicate data are of a higher quality. Enter a code "1" to indicate the respondent referred to and used written records when reporting the indicated items.

Item 7a: Fertilizer Data

If farm records were used for completing the majority of the **fertilizer** data items in the questionnaire, enter code "1"=YES in cell 0011.

Item 7b: Pesticide Data

If farm records were used for completing the majority of the **pesticide** data items in the questionnaire, enter code "1"=YES in cell 0012.

Item 7c: Expense Data

Indicate whether farm/ranch records were used for the completing most of the **expense** items in the questionnaire. **Enter** code "1"=YES in cell 0013.

Item 8: Supplements Used

Record the total number of each type of supplement used in completing this interview in the designated cell. These items are important to provide a means to check for misplaced or lost supplement sheets during the computer edit. Be sure all of the supplements are inside the questionnaire before mailing the questionnaire or turning it over to a supervisor.

Administrative Items

Response Code

Upon completion of the interview, enter the response code in cell 9901 on the Back Page of the questionnaire. Response codes are:

Code 1 - **Complete** The questionnaire is complete, including questionnaires for respondents that are no longer in business.

- Use Response Code 1 for operations that you have determined DID NOT grow the target commodity this year. Complete means you have obtained all of the data needed for the questionnaire.
- Use Response Code 1 for institutional farms, such as prison farms, private or university research farms, high school FFA farms, not-for-profit farms operated by religious organizations, and Indian reservations produce agricultural commodities, but do not meet the ARMS definition of a farm or ranch. Production practices, costs, and income characteristics of these

	operations are not representative of the general farm population. Assign Response Code 1 to these types of operations, and describe the specific type of operation on the face page with a note.
Code 2 - **Refusal**	The respondent refused to cooperate or grant an interview.
Code 3 – **Inaccessible/Incomplete**	The operator was not available throughout the survey period (inaccessible). You will also use code 3 if the respondent gave an interview but could not or would not answer a lot of the questions (incomplete questionnaire)

Respondent Code

The respondent code identifies the person who was interviewed. Enter the code identifying the person who provided most of the data in cell 9902.

Code 1 = **Operator or Manager**
Code 2 = **Operator's Spouse**
Code 3 = **Accountant or Bookkeeper**
Code 4 = **Partner**
Code 8 = **Office Hold**
Code 9 = **Other**

Record the respondent's name and phone number.

Mode Code

The mode code identifies how the person was interviewed. ARMS Phase II completes must be by face-to-face interview.

Code 2 = **Telephone** Code 3 = **Face-to-Face**

Enumerator Name

Sign the questionnaire and record your enumerator ID number in cell 9998.

Date

Record the date the questionnaire was completed. Enter the date in MMDDYY format on the lines provided in cell 9910. For example, if

the interview was completed on November 8, 2017, enter the month and day 1 1 0 8 in the date cell. The 2-digit year is already preprinted on the questionnaire.

Optional Use

Item codes 2 and 3 are reserved for your Field office use. These cells should remain blank unless your Field office directs you otherwise.

Review the entire questionnaire before forwarding it to your Supervisor. Make sure all items are complete, including 'Yes' and 'No' boxes checked, and dashes are entered in cells when the response is 'None' or 'No' as appropriate. Make sure notes are present and complete for unusual situations.